THE EFFECT OF FOREIGN DIRECT INVESTMENT ON ECONOMIC GROWTH:
EVIDENCE FROM SOUTH AFRICA

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ABSTRACT

Foreign direct investment amongst other mechanisms provides capital inflow meant to stimulate economic growth. Apart from promoting economic growth, FDI can also lead to increase in employment, technology, technical knowhow and managerial skills.

South Africa has implemented various policy initiatives in attempts to attract foreign investment. This study investigates on the effect of foreign direct investment on economic growth, with particular reference to the South African economy. The period of study is from 1980 to 2010.

The study begins by reviewing literature on economic growth and foreign direct investment. South Africa’s macroeconomic background is examined to determine the trends in FDI inflows and economic growth. An empirical model linking theoretical and empirical literature on the effect of FDI on economic growth is estimated using the Johansen cointegration and VECM framework. Variables specified in the methodology include real gross domestic product (RGDP), foreign direct investment (FDI), domestic investment (INVE), real exchange rate (REXCH) and foreign marketable debt (DEBT).

The long run results showed that FDI, REXCH and DEBT have a negative impact on growth. INVE has a positive impact on growth. Short run results indicated that there is no strong pressure on RGDP to restore long-run equilibrium whenever there is a disturbance. The short run lag of FDI was found to exert a positive impact on growth.

The impulse response and variance decomposition analysis complemented the long and short-run findings. Shocks on REXCH, and DEBT generated a negative response on RGDP. The shocks were not significantly different from zero and were transitory.

Results from the variance decomposition analysis revealed that the fundamentals explain some, but not all, of the variations of RGDP. For the fifth year forecast error variance RGDP explains the largest component of the variation followed by INVE, REXCH, FDI and DEBT. After a period of ten years, the influence of RGDP and INVE declines, whereas REXCH, FDI and DEBT increase.
Conclusions and policy recommendations were made using these results.

**Keywords:** Foreign direct investment, Economic growth, South Africa
DECLARATION

I, Mazenda Adrino, the undersigned, hereby declare that this dissertation is my own original work with the exception of quotations and references of which the sources are acknowledged. This dissertation has not been submitted, and will not be presented at another University for the conferring of a similar or any other degree award.

Signature ..........................

Date ........../........./.........
ACKNOWLEDGEMENTS

First and foremost, I would like to appreciate the Lord in the wisdom, knowledge and grace vested in me throughout the research process. His strength was made perfect in my weaknesses.

My profound gratitude also rests on my supervisor Professor Ronney Ncwadi. His unconditional support and research experience will forever be commendable.

Special mention goes to Pastor Gethsemane Gwisira for moral and spiritual support. If the foundation is broken, what can the righteous do? Finally, I express my appreciation to all my family members for their unequivocal support throughout my Masters’ studies.
DEDICATION

This dissertation is dedicated to the following churches; The Way, Ministers Ministries and Salvation Prayer Ministries.
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<p>| ADF      | Augmented Dickey-Fuller               |
| AGOA     | African Growth and Opportunity Act   |
| AIDS     | Acquired Immune Deficiency Syndrome  |
| ASEAN    | Association of Southeast Asian Nations |
| ASGISA   | Accelerated and Shared Growth Initiative for South Africa |
| BIPA     | Bilateral Investment and Protection Agreement |
| BOP      | Balance of Payments                  |
| BRICS    | Brazil-Russia-India-China-South Africa |
| CIP      | Critical Infrastructure Programme    |
| CSA      | Customs Secured Area                 |
| CSAs     | Country Specific Advantages          |
| DEAT     | Department of Economic Affairs, Environment and Tourism |
| DF       | Dickey Fuller                        |
| DTI      | Department of Trade and Industry     |
| ECM      | Error Correction Model               |
| EMIA     | Export Marketing and Investment Assistance |
| EU       | European Union                       |
| FDI      | Foreign Direct Investment            |
| FIFA     | Federation of International Football Association |</p>
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<thead>
<tr>
<th>Acronym</th>
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<tr>
<td>FIG</td>
<td>Foreign Investment Grant</td>
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<td>FPI</td>
<td>Foreign Portfolio Investment</td>
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<td>FSA</td>
<td>Firms Specific Advantage</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GEAR</td>
<td>Growth Employment and Redistribution</td>
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<td>HDR</td>
<td>Human Development Report</td>
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<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<td>IDZs</td>
<td>Industrial Development Zones</td>
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<td>IIMS</td>
<td>Inward Investment Missions Scheme</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>IPI</td>
<td>Industrial Production Index</td>
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<td>ISC</td>
<td>Industries and Services Corridor</td>
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<td>J-B</td>
<td>Jarque-Bera</td>
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<td>LDC</td>
<td>Least Developed Countries</td>
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<td>LM</td>
<td>Langrange Multiplier</td>
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<td>MIDP</td>
<td>Motor Industry Development Program</td>
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<tr>
<td>MFN</td>
<td>Most Favoured Nation</td>
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<td>MNCs</td>
<td>Multinational companies</td>
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<td>MNE</td>
<td>Multinational Enterprise</td>
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<td>NGP</td>
<td>New Growth Path</td>
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<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>PAA</td>
<td>Productive Asset Allowance</td>
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<td>Acronym</td>
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<tr>
<td>PP</td>
<td>Phillips Perron</td>
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<td>R&amp;D</td>
<td>Research and Development</td>
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<td>RDP</td>
<td>Reconstruction and Development Programme</td>
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<td>SA</td>
<td>South Africa</td>
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<td>SADC</td>
<td>Southern Africa Development Community</td>
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<td>SADPA</td>
<td>South African Development Agency</td>
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<td>SARB</td>
<td>South African Reserve Bank</td>
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<td>SDI</td>
<td>Spatial Development Initiative</td>
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<td>SIP</td>
<td>Strategic Investment Programme</td>
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<td>SMEDP</td>
<td>Small and Medium Enterprises Development Programme</td>
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<td>StatsSA</td>
<td>Statistics South Africa</td>
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<td>TISA</td>
<td>Trade and Investment South Africa</td>
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<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>USA</td>
<td>United States of America</td>
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<tr>
<td>VAR</td>
<td>Vector Autoregressive</td>
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<td>VAT</td>
<td>Value Added Tax</td>
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<td>WIR</td>
<td>World Investment Report</td>
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CHAPTER 1

INTRODUCTION

1.1 Background

Over the past decade, many developing countries around the world have experienced substantial growth in their economies, with even faster growth in international transactions, especially in the form of foreign direct investment (FDI) (WIR, 2011). The net share FDI of World Gross Domestic Product (GDP) has grown more than five times in the nineties and early 20th century, making the causes and consequences of FDI and economic growth a subject of ever-growing interest (WIR, 2011:44).

The effects of FDI from the viewpoint of the target country have been examined thoroughly, but the empirical results are contradictory. Foreign direct investment (FDI) as transmitted by the multinational corporations has several welfare implications, one of which is the effect of FDI on economic growth of the recipient country. On one hand, if FDI has a positive impact on economic growth, then the host country should encourage FDI flows by offering tax incentives, infrastructure subsidies, import duty exemptions and other measures to attract FDI. On the other hand, if FDI has a negative impact on economic growth, then a host country should take precautionary measures to discourage and restrict such capital flows (Lyroudi, Papanastasiou, and Vamvakidis, 2004:99).

According to Carkovic and Levine (2002) Firm-level studies of specific countries often find that FDI does not boost economic growth, and in retrospect, there is no evidence of a positive technology spill-over from foreign firms to domestically owned firms. In contrast, macro-economic studies on growth and FDI often confirm positive evidence on the notion that FDI enhances growth, and leads to positive technology spill-over from foreign to domestic firms, however these results must be viewed sceptically since they do not fully control for simultaneity bias, country specific effects, and the routine use of lagged dependent variables in growth regressions (Carkovic and Levine, 2002:2).
Numerous studies have investigated the determinants of economic growth in South Africa, including the contribution of aggregate investment expenditure. Few have addressed the distinction between domestic and foreign investment expenditure on long run development and on economic growth (Fedderke and Romm, 2004).

According to Borensztein, Gregorio and Lee (1998:120), foreign direct investment in South Africa has tended to be capital intensive with determinants resulting from the net rate of return as well as the risk profile of the foreign direct investment liabilities. He Borensztein et al, (1998:120) further reiterate that theoretical and empirical literature suggests the advent of policy and non- policy factors as drivers of foreign direct investment. Non-policy factors include market size, distance factor proportions, political and economic stability. Policy factors include openness to trade, product market regulation, labour market arrangements, corporate tax rates and infrastructural development (Borensztein, et al, 1998:121).

The growth structure in South Africa has shifted from factor accumulation to efficiency gains as measured by total factor productivity. Thus technology and skills transfer assume great importance as spill-over from foreign direct investment (Romm, 2005:180). Unemployment is the major impediment to the realization of growth prospects with 24 per cent of the economically active in South Africa being unemployed by June 2010 (Stats SA, 2010). In order to address the unemployment problem as well as economic growth, the government established a number of macroeconomic policies, namely RDP, GEAR, ASGISA and NGP. These macroeconomic policies have a common thread in theme of employment creation and growth. Nevertheless the growth prospects as envisaged in these policies have not been realised to the full in South Africa. In order to boost economic growth as well as employment creation in South Africa, foreign direct investments are necessary.

Xavier (1994:15) argues that suitable factors of production, supportive government incentives and managerial expertise enhance the chance of attracting foreign direct investment. He further asserts that aspects such as infrastructure, government support, firm strategy and customer demand prove to be important elements in the location of industries and economic growth. Thus an improved understanding of the determinants of portfolio capital flows as well as foreign direct investment flows should prove useful in lifting restrictions on capital movements.
1.2 Statement of the Problem

Since the end of apartheid, the South African government has made efforts to liberalize trade, enhance international competitiveness and promote foreign investment. This has been achieved through a number of mechanisms, including lowering tariffs, abolishing most important controls, privatization and reforming the regulatory environment (Pakes and Nel, 1998:20).

Despite all these mechanisms, South Africa’s economic growth has been sluggish over the years, posting an overall growth rate of less than 4 per cent from 1999 to 2007, falling to 3.1 per cent in 2008 and 1.8 per cent in 2009 before a slight recovery of 4.6 per cent during the first quarter of 2010. Thus the country faces daunting challenges as it competes with other emerging market countries for foreign investment (HDR, 2010:37).

In view of the preceding, this study seeks to examine the effect of foreign direct investment on economic growth in South Africa.

1.3 Objectives to the Study

The main objective of the study is to explore the effect of foreign direct investment on economic growth in South Africa.

The Specific objectives are as follows:

i. To examine theoretical underpinnings on the effect of foreign direct investment on economic growth.
ii. To analyse the pattern of FDI inflows and economic growth in South Africa.
iii. To make policy recommendations.

1.4 Hypothesis of the Study

H0: FDI enhances economic growth.

H1: FDI does not enhance economic growth.

1.5 Significance of the Study

Numerous studies have investigated the determinants of economic growth in South Africa, including the contribution of aggregate investment expenditure on growth. Few have addressed
the distinction between domestic and foreign investment expenditure on long run development 
and economic growth (Fedderke and Romm, 2004).
This study contributes towards the on-going debates on the impact of foreign direct investments 
on economic growth. Accordingly this study seeks to establish to what extent does foreign direct 
investment impact growth both in the short run and long run in South Africa. The results of this 
study will provide policy makers at all government levels as well as commercial organizations 
with a piece of research that could stimulate the attraction of foreign direct investment in South 
Africa. Furthermore, the government will be in a better position to determine whether to pursue 
policies meant to support domestic investment or foreign direct investment.

1.6 Methodology of the Study
The study is guided by the quantitative research methodology. Specifically the study uses 
econometric modelling, namely, VECM to analyse the data. In order to provide a conceptual 
framework, a literature review is provided in Chapter two, wherein various theories relating to 
economic growth and foreign direct investments are outlined. A detailed outline on research 
methodology is provided in Chapter four.

1.7 Outline of the Study
Chapter one provides an introduction and background to the study. A problem statement, 
research methodology, and significance of the study are also provided in the chapter. Chapter 
two provides a discussion on the theoretical and empirical literature review of the theories of 
economic growth and foreign direct investment. Chapter three provides an overview of FDI 
flows and economic growth in South Africa. The analysis also provides an assessment of the 
determinants of FDI inflows in South Africa. Chapter four discusses the econometric methods 
used for analysis in the study. The chapter also describes and explains data and variable selection 
used in the model. Chapter five provides a report and interpretation of empirical findings. 
Chapter six presents a summary of the main findings, conclusions and policy recommendations. 
The next chapter provides theoretical as well as empirical literature.
CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The aim of this chapter is to provide a review of literature on economic growth and foreign direct investment. The chapter is divided into two sections. The first part of the chapter discusses the main economic growth theories. This is followed by a theoretical review of microeconomic theories of foreign direct investment. The second part of the chapter provides empirical evidence on developing and developed countries and on South Africa.

2.2 Theories on Economic Growth

Theories on economic growth have existed for many years and provide a basis for understanding the role that savings and investments play in the industrial development of economies. Among these is the Keynesian growth theory as portrayed by the Harrod-Domar growth model which will be discussed in the next section. This is followed by the Neo-classical growth theory and the New (Endogenous) growth theory.

2.2.1 Harrod-Domar Growth Model

The Harrod-Domar growth model represents the Keynesian economics school of thought. It models growth as an outcome of the equilibrium between saving and investment.

According to Nafziger (1997:123), Harrod designed the model in an attempt to establish the rate of growth in income that would induce equilibrium between saving and investment. The fundamental variables in the model include capital accumulation and the ratio of increase in output to increase in investment. This can be represented as $\Delta K$ and $\Delta K/\Delta Y$ respectively. The change in output is a result of change in capital stock ($\Delta Y=\Delta K$). The change in capital stock is due to investment, thus $\Delta K=I$.

In order to determine whether or not the actual growth rate will create a situation where desired investment equals desired saving, Harrod (1939:79) distinguished between three different growth rates, actual growth rate ($g$), warranted growth rate ($g_w$) and natural growth rate ($g_n$).

The actual growth rate is shown as a ratio of saving out of income $s$ to the ratio of change in capital to the change in output ($\Delta K/\Delta Y$). This is shown as:
\[ g = \frac{s}{c} \]  

Substituting the expressions for \( s \) and \( c \) into equation (i) gives \( \frac{s}{c} = \frac{S/Y}{I/Y} \), which shows output growth, when savings (\( S \)) = investment (\( I \)) and \( \Delta Y/Y \) indicates the growth of output.

According to Harrod (1939:80), the warranted growth rate is the growth rate that encourages investment, such that investment and saving are in equilibrium and the capital stock is fully utilised. Thus desired expenditure equals output, that is \( g = g_w \). This provides the basis for economic agents and entrepreneurs to continue investing, at the same time encouraging economic growth.

In a situation where the desired level of saving is not equal to the desired level of investment (\( g \neq g_w \)), the output growth rate will translate into a recessionary or an inflationary gap.

Harrod (1939:81) made an analysis of two scenarios, that is when the actual growth rate is greater than the warranted growth rate, \( g > g_w (\Delta K/\Delta Y > I/\Delta Y) \), and when the actual growth rate is less than the warranted growth rate. \( g < g_w (\Delta K/\Delta Y < I/\Delta Y) \). In the first scenario (\( g > g_w \)), investment is not enough to maintain a constant capital stock growth. As a result, an inflationary gap opens. With increased investment, the inflationary gap widens due to an increase in actual output, emanating from an increased demand for factor inputs.

In the latter case, when \( g < g_w \), desired investment exceeds the current capital stock growth rate. Resources become idle and investment is discouraged. This will result in a recessionary gap. The significance of this disequilibrium is that it will be self-aggravating. This is because when \( g > g_w \), an incentive to invest is initiated, while when \( g < g_w \), there will be a disincentive to invest.

Domar (1947:81), working independently of Harrod, agreed with Harrod’s conclusion that a departure of the economy from the equilibrium was self-aggravating. He pointed out that investment, while contributing to aggregate demand via the multiplier, also increases supply through its effect on expanding productive capacity. He established the rate of investment that provides a basis for supply to equal demand at the potential income level. This equilibrium requires that;

\[ \Delta Y_d = \Delta Y_s \]
Where $\Delta Y_d = \Delta I/s$, which implies that a change in the level of investment $\Delta I/s$ causes a change in the level of demand $\Delta Y_d$, and also causes a change in the level of supply $\Delta Y_s$ by

$$\Delta Y_s = I\partial$$

(2.3)

$\partial$ resemble capital stock productivity. Thus the investment growth rate $\Delta I/I$ must equal investment and capital stock productivity for full equilibrium to exist.

The Domar analysis of growth did not guarantee full employment of labour, even in the presence of full utilisation of capital stock, hence giving an allowance for Harrod’s natural growth rate. This follows Thirwall (2003:140) preposition, that the actual growth rate cannot exceed the natural growth rate.

This is in instances when all the active labour force is employed. Thus it is of paramount importance to establish the economy’s long run relationship between capital growth and labour force growth which aggravates to full employment.

The Harrod-Domar growth model gives a clear outline of the development problems facing less developed nations. This is especially in regard to production techniques. According to Thirwall (2003:141), developing countries can alter the capital-labour ratio when they shift towards the use of more labour-intensive production techniques without compromising on output levels.

Failure of the Harrod-Domar growth model in achieving steady growth at its potential level gave rise to the introduction of other growth models that allowed the substitution of economic variables, such as the neoclassical growth model and the new endogenous growth model.

**2.2.2 Neoclassical Growth Model**

The Neoclassical Growth model was developed by Robert Solow and Trevor Swan in the 1950s. The model entails that the rate of growth of GDP is increased by a higher share of GDP devoted to investment, decreased by a higher rate at which the physical capital stock depreciates, and increased by faster growth in technology or total factor productivity (Solow 1962).

The neoclassical growth model assumes that technological progress is exogenously determined and its level is the same across countries. It is renowned for its use of the Cobb-Douglas production function and assumes that, first, the labour force growth is constant; second, all saving is invested,
that is, saving \((S)\), investment \((I)\) and the propensity to save \((sY)\) are all equal; and, third, output \(Y\), is determined by the interaction of capital and labour, that is,

\[
Y = F (K, L). \quad \text{.......................................................... (2.4)}
\]

The production function \(Y = F (K, L)\) shows constant returns to scale and diminishing returns to scale of the variable factor, in the event of other factors being held constant (Mankiw, 2003:83). These assumptions will then be used in explaining why the economy reaches a steady-state level of growth when capital per worker and the investment requirement are in equilibrium.

The model asserts that the increase in the labour supply and or investment in equipment and machinery increases productivity. Technological change is regarded as a major contributor to productivity, through invention and innovation (Burda and Wyplosz, 2001:44). Increase in capital stock, which takes the form of physical or human capital is also capable of increasing labour productivity. Physical capital emanates from investment in real capital. Human capital involves human investment in education and training (Becker and Barro, 1988:66).

The Criticism against the neoclassical growth model gave rise to the endogenous growth theory. The assumption of perfect competition assumes that equilibrium will be achieved, ensuring maximum allocation of resources by markets themselves. When markets fail to clear, uncertainty emerges and information becomes imperfect. This causes instability in expectations and accrues in the market as investment plans are scaled down. The effect of change in investment plans impacts negatively on economic growth.

Solow brings in technological change when the growth process reaches a steady state. This type of technical process is assumed to be neutral. It is not responsive to any forces in the model. Thus it becomes difficult to discuss the extent of technological change in the model.

Another assumption of the neoclassical model, that technology is exogenously determined, and its level of availability is the same throughout the world has been criticised by Stonier and Hague (1975:621), who argue that technology in the model is tradable in a perfectly competitive market where it is freely available and is endogenously determined for long-run economic growth.
The new endogenous growth theory will be discussed in the subsequent section, in an attempt to overcome the problems of the neoclassical theorists.

### 2.2.3 New (Endogenous) Growth Theory

The New Endogenous Growth theory covers the loop holes of the neoclassical growth theory, which assumes that technological change is exogenously determined in explaining long-run economic growth. This has resulted in failure to explain differences in technologies across countries. These technological differences help to explain why some countries are rich and others are poor.

The new growth theory provides a model where technology is endogenously determined. Technology is envisaged in the model by introducing a sector of research and development that produces new ideas. The ideas are used to manufacture capital goods in monopolistic competition which allows researchers to earn profit from their efforts. The sector that produces final goods uses them as factor inputs (Romer, 1993:76).

According to Jones (1998:72) new ideas or knowledge changes technologies in production. These technological changes make production inputs more productive. The theory faces three major propositions: first, technological change is central to the generation of long-run growth. Second, technological improvement is mainly influenced by intentional actions of agents who respond to market incentives. Third, the economics of ideas is different in that the cost of production is incurred only once, and the ideas can be used over and over again without attracting further costs.

In the new endogenous growth theory, price-taking behaviour cannot be entertained due to the insurgence of monopolistic competition. This is incorporated in the principle of non-rivalry and non-excludability of technological change. When a good such as knowledge is non-rivalry, it means that its consumption by one person does not preclude another from consuming it (Romer, 1990:72).

According to Pack (1994:65) non-rivalry holds significant implications for the growth theory. Non-rivalry goods such as public goods can be accumulated to an unlimited extend, and can be used in the same place at the same time. Rival goods such as human capital have a limited life span, and in death of a person, his knowledge disappears from the economic scene. Non–rival goods need not be replicated. This implies that inputs in the production process should combine rival and non-rival goods so as to experience increasing returns to scale.
In order to increase long-run economic growth in the model, the number of researchers must increase. Same applies to the rate of population growth. The same implies to the rate of population growth. This implies that the growing population is one with technical skills that can be used for innovation processes. In this regard, the model is fitting only to the developed countries; however developing countries can learn a lesson from this outcome in their quest of poverty eradication.

2.3 Theories on FDI

Numerous theories have been developed in FDI literature. These theories have been classified as microeconomic theories and macroeconomic theories of FDI. Microeconomic theories focus on the characteristics of a firm that influence its decision making processes. These include market imperfections, market power and investment location theories.

Macroeconomic theories of FDI seek to investigate on a country’s characteristics that explain FDI inflows within and across countries. Examples include internalization and product cycle theories.

FDI literature has also reviewed theories that focus on FDI motives. This was so because there where anomalies in classifying them under the microeconomic or macroeconomic theories. These include natural resource seeking, market seeking and efficiency seeking theories.

This section deals with the microeconomic theories of FDI. Dunning’s eclectic theory and Hymer’s industrial organisation theory will be discussed next.

2.3.1 The Eclectic Theory

The theory is postulated by Dunning (1973) and seeks to offer a general framework for determining patterns of both foreign owned production undertaken by a country’s own enterprises and also that of domestic production owned by foreign enterprises. According to Dunning (1973), there are two types of investment that a firm can chose to undertake. That is, Foreign Portfolio Investment (FPI) and Foreign Direct Investment (FDI). FPI is defined as the passive holdings of securities and other financial assets, which do not entail active management or control of securities issuer. FPI is positively influenced by high rates of return and reduction of risk through geographical diversification. The return of FPI is normally in the form of interest payments or non-voting
dividends. FDI is defined as the acquisition of foreign assets for the purpose of control (Dunning, 1973).

The eclectic theory is launched in three pillars of Ownership, Location and Internalisation (O+L+I). The three pillars are different questions that foreign investors seek to answer. The O pillar comprises of the ownership advantages that addresses the question why the foreign firms need to go abroad. According to Dunning (1985), this question hypothesizes that foreign firms have one or more firm specific advantages which allows them to overcome operating costs in a foreign country. The ownership advantages include core competency, brand name and economies of scale amongst others.

The L pillar addresses the question of location. According to Dunning (1985), the decision of the firm to move offshore is based upon the firm specific advantage in conjunction with factors in a foreign country. Factors such as land and labour are important in determining the location of a Multinational Enterprise (MNE) in order for it to make profits. Dunning (1985) further asserts that the choice of investment location depends on several complex calculations that include economic, social and political factors to determine whether investing in that country is profitable or not.

The I pillar represents the internalisation advantages on how to go abroad. The MNE have several options to choose from in their entry mode in a foreign country. Choices range from the arm’s length transactions (market) to the hierarchy (wholly owned subsidiary). The MNE can choose internalisation if the market does exist or functions poorly, that is transaction costs of the external route are high. Under the firm specific advantage, an MNE operating a plant in a foreign country can be faced with a number of additional costs in relation to their local counterparts (local competitor). These costs according to Dunning (1985) comprises of;

i. Cultural, legal, institutional and language differences

ii. Lack of knowledge about local market conditions

iii. The increased expense of communicating and operating at a distance

The eclectic theory therefore points out that for a foreign firm to be competitive in a foreign country, it must have some kind of unique advantages that can help them overcome the cost associated with operating in the new country. These advantages are called ownership or firm specific advantages
(FSAs) or core competencies and they help the foreign firm in generating high revenues for the same cost, or lower costs for the same revenues compared to domestic firms. Dunning (1997) identified three main types of ownership advantages for multinational enterprises. These include:

i. **Knowledge/technology** defined to include all forms of innovative ideas.

ii. **Economies of large size** include economies of scale, scope, learning and broader access to financial capital and diversification of assets and risks.

iii. **Monopolistic advantages** occur in the form of privileged access to input and output markets through patent rights and ownership of scarce natural resources.

Dunning (1997) reiterated that ownership advantages can change over time and varies with age and experience of the multinational enterprise. The firm must use some foreign factors in connection with its domestic Firm Specific Advantages in order to earn full rent on the FSAs. The locational advantages of various countries are keys in determining which country will play host to the MNE. Dunning (1997) distinguished between three categories of country specific advantages (CSAs) as follows; Economic, Social and Political. The economic advantages include the quantities and qualities of the factors of production, size and scope of the market, transport, as well as telecommunications costs. Social advantages include psychological distance between the home and the host country, general attitude towards foreigners, language and cultural differences and the overall stance towards free enterprise. Finally the political advantages include the general and specific government policies that affect inward FDI inflows, international production and intra-firm trade. Thus, an attractive (CSAs) package for a multinational enterprise would include a large and growing high income market, low production costs, a large endowment of factors scarce in the home country, politically stable economy and a country that is culturally and geographically close to the home country.

The eclectic theory points out that the existence of a special knowhow or core skill is an asset that can generate economic profits to a foreign firm. These profits can be earned by licencing the Firms Specific Advantage (FSA) to another firm, exporting products using the FSA as an input or setting up subsidiaries abroad. Furthermore the theory provides that a hierarchy (vertically or horizontally integrated) is a better method of organising transactions than the market (trade between unrelated firms) whenever external markets are nonexistence or imperfect. Thus internalisation advantages
lead to preferentially wholly owned subsidiaries by MNEs over arm’s length transactions. However in setting MNEs abroad Dunning (1997) identified the following difficulties;

i. Natural Market failure (natural imperfections).

ii. Lack or insufficient information on pricing, costs and benefits.

iii. Transaction costs under conditions of risk, uncertainty, moral hazard and adverse selection.

iv. Structural market failure due to imperfections created by MNEs.

v. Monopoly power exertion using oligopolistic methods, predatory pricing, cross subsidization, market cartelization and market segmentation.

vi. Arbitraging government regulations and exploiting regulations in terms of tariffs, taxes, price controls and non-tariff barriers.

Furthermore, Dunning (1994) highlighted that FDI in developing countries is shifting from market seeking and resource seeking FDI to more efficiency seeking FDI. This is due to socio-economic pressures induced on prices, thus MNEs are expected to relocate some of their production facilities to low cost developing countries. Despite of these developments, FDI in developing countries is still directed at assessing natural resources and national or regional markets.

Like any other model, the eclectic theory has its weaknesses. It has been suggested in the theory that the OLI variables are independent of each other. This notion has received much criticism by international trade scholars. The understanding is that it is very difficult to separate these variables as they work hand in hand. For example a firm’s response to its exogenous locational variables might itself influence its ownership advantages and its ability and willingness to internalise markets. Therefore over time, the separate identity of variables becomes difficult to justify.

Kojima (1982) claimed that the explanatory variables identified by the eclectic theory under each pillar are so numerous that its predictive value is almost zero. Furthermore he, Kojima (1982) argued that the eclectic theory insufficiently allows for differences in the strategic response of firms to any given configuration of OLI variables.

The theory has been viewed in static or comparatively static terms. In this regard, it offers less guidance to the dynamics of the international process of firms and countries.
The eclectic theory is relevant to the study as it identifies the determinants of MNEs to invest abroad as portrayed in the OLI variables. For instance, in the case of the location advantage, foreign investors have the advantage of choosing the location where the plants will be built. In most cases these locations are close to the ports and harbours for the ease of transportation. Furthermore foreign investors have the ownership advantage which includes brand names, benefits of economies of scale and technology.

2.3.2 Industrial Organisation Theory
The theory is also known as micro-level theory of FDI and is attributed to the work of Hymer (1960). In the theory Hymer (1960) suggests that the decision to set up value-adding operations abroad depends on the industry and certain aspects of individual companies, rather than the country and national capital availability as suggested by Dunning (1973).

The theory makes emphasis on two main points. Firstly, the firms become MNEs due to their possession of competitive advantage and their ability to maximise their productivity by using this competitive advantage in another country. This however leads to the concept of ownership advantages as discussed by Dunning (1994). Secondly, the competitive structures of some industries would encourage firms to internationalise more than those in other countries.

Hymer’s industrial organisation theory of FDI hypothesises that the rate of profit has a tendency to drop in industrialised countries. This is due to domestic competition, thus creating the propensity for firms in underdeveloped countries to engage in FDI. The theory considered tradable ownership advantages and the removal of competition as key requirements for an individual firm in a given industry to invest overseas and thus become an MNE.

Hymer made four assumptions under the micro-level theory of FDI namely;

i. In the post-war years, FDI was two-way between developed and developed countries. Other theories suggested that the flow of capital was one way from developed to underdeveloped countries.

ii. A country was supposed to either engage in outward FDI or receive inward FDI only. Hymer observed that MNEs moved in both directions across national boundaries in industrialised countries. This implies that countries simultaneously receive inward FDI and engage in outward FDI.
iii. The level of FDI was found to vary between industries. This means that, if capital availability was the driver of FDI, then there should be no variation since all industries would be equally able and motivated to invest abroad.

iv. Due to local financing of foreign subsidiaries, it was not practically plausible that capital moved from one country to another.

Hymer (1976) strongly argued that MNEs can only exist in an imperfect market, when firms have non-financial ownership advantages compared to other firms in the same industry. This means that the determinants for MNEs lie with the individual firms, rather than country’s capital availability as suggested by the eclectic theory of FDI. Hymer (1976) further discusses the nature of the market power approach of firms and their oligopolistic interdependence in collusive agreements, as they focus on domination of the market, the raising of entry barriers and the removal of conflict. Hymer (1960) asserts that firms invest abroad in order to dominate more markets, raise profits and create more conflict- removing oligopolies. This means only the largest firms, such as those in an oligopoly environment could sufficiently offset the costs of being foreign with their strong ownership advantages.

Congruent with Dunning (1973), Hymer believed that MNEs investing in foreign markets are, compared to local firms, faced with certain additional costs and risks in terms of knowledge of local market conditions, cultural, institutional and linguistic barriers and communication and transport costs. Thus firms that wish to invest through FDIs in these foreign markets must have specific advantages to gain a competitive on local firms in a foreign country. These advantages include advanced technology, Research and Development capabilities, superior managerial, administrative and marketing skills, access to low-cost funding and interest rate and exchange rate differentials.

Hymer was of the opinion that, in the world of segmented national markets which are dominated by home grown monopolists, a merger of two such firms or the acquisition of one by the other would result in externalities or internalisation of MNEs from the latter (creation of a firm spanning the two countries). Hymer therefore believed that MNEs were internalising externalities due to competition on markets for final products. In simple terms this means that as competition intensifies between two firms on markets for final products, prices charged on consumers are lowered such that they end up losing their monopoly profits. Hymer identified a positive relationship between oligopolistic market structures and FDI by United States firms. This leads to the conclusion that competitive conditions and firm specific advantages influence FDI positively. This is in agreement to arguments suggested by Dunning (1973).
Hymer’s theory has been criticised openly by other scholars. Yamin (2000) in Dunning (1973) stated that Hymer discusses the theory behind how and why firms invest in international markets, but ignores how firms operate efficiently in other countries, including their use of advantages. Yamin observed that Hymer assumed firms were merely reacting to structural market failures, whereas in reality firms are in fact proactive in their use of advantages.

Hymer (1976) believed that a firm’s main objective was profit maximisation and expansion. However, Yamin (2000) argued that firms actively employ and develop assets with the aim of improving internal efficiency. Thus it is believed that oligopolies succeed through their size rather than possessing an ownership advantage, as the purpose of oligopolies is to remove conflict, whereas assets increase competition and encourages innovation.

Hymer (1976) proposed that only oligopolies can invest abroad, however this is not the case nowadays. This denotes the decrease in importance of market power as a final strategy in the location of MNEs.

Another weakness of the industrial organisation theory it is largely based on the market power approach, completely ignoring the costs associated with making transactions to invest abroad. Dunning and Rugman (1985) believed that cognitive market failures require transaction- specific assets to minimise these costs, but Hymer only included tradable advantages, such as scale economies and technologies when making decisions to invest abroad.

The industrial organisation theory is relevant to this study as it points out the reason why foreign investors decide to set up value adding operations abroad depending on industry and certain aspects of individual companies. Firms that want to invest through FDI must therefore have competitive edge on local firms in destined counties through technology, Research and Development, access to low funding, favourable interest rates and exchange rate differentials.
2.3.3 Assessment of Theoretical Literature

Of the growth theories reviewed, the traditional neoclassical and new endogenous growth theories are relevant to the study. Both theories use a production function based approach in identifying factors that contribute to economic growth. The neoclassical growth theory assumes that capital and labour are the fundamental determinants of economic growth. However, the theory predicts that an economy will reach a steady state of equilibrium due to diminishing marginal product of capital and technology (exogenous). The weakness of the neoclassical theory is that it fails to explain the determinants of this exogenous variable. The prediction of absolute convergence where developing countries with the same access to technology as developed countries will catch up is another weakness. Due to these weaknesses, the endogenous growth theory becomes more relevant. The endogenous growth model becomes relevant because it considers technology to be endogenous. The theory outlines that positive externalities such as human capital development and Research and Development prevent marginal product from declining. Technological progress unlike the neoclassical theory is attributed to these positive externalities. Human capital development through knowledge accumulation and skills development contributes positively to growth in output. Companies that engage in R&D cannot isolate benefits to themselves but to society at large due to spill-over effects. Spill-over effects have resulted in an increase in transfer of technology in the South African motor industry. If companies cannot enjoy individual benefits of R&D, there is need for government incentives. The Motor Industry Development Programme (MIDP) is one such programme among others, introduced by the South African government to incentivise vehicle manufacturers (Flatters, 2005:2).

In analysis of theories on FDI, the eclectic theory and the industrial organisation theories were discussed. The main highlight of the eclectic theory is that of the ownership advantage. The theory points out that for a country to be competitive in a foreign country, it must have some kind of a unique advantage that can help them overcome the cost associated with operating in a new country. In this regard the eclectic theory is regarded as a positive contributor to FDI discussions.

The industrial organisation theory considered tradable ownership advantages and the removal of competition as key requirements for an individual firm in a given industry to invest overseas. In the theory Hymer (1960) suggests that the decision to set up value-adding operations abroad depends on
the industry and certain aspects of individual companies, rather than the country and national capital availability as suggested by Dunning (1973).

The theory makes emphasis on two main points. Firstly, the firms become MNEs due to their possession of competitive advantage and their ability to maximise their productivity by using this competitive advantage in another country. This however leads to the concept of ownership advantages as discussed by Dunning (1994). Secondly, the competitive structures of some industries would encourage firms to internationalise more than those in other countries.

The major criticism of Hymer’s theory is that Hymer discusses the theory on how and why firms invest in international markets, but ignores how firms operate efficiently in other countries, including their use of advantages. Furthermore, the theory is largely based on market power approach, completely ignoring the costs associated with making transactions to invest abroad.

Despite of the limitations, the industrial organisation theory is useful to this study as it points out the reason why foreign investors decide to set up value adding operations abroad depending on industry and firm attributes.

### 2.4 Empirical Literature

This section presents empirical literature to the study.

#### 2.4.1 Studies on Developed Countries

Pradhan (2011) explored on the role of FDI on the trade-led growth hypothesis in three counties, namely Australia, Canada and Israel for the period 1965-2009. The study was based on panel cointegration and causality tests. The results show long-run cointegration relationship of FDI and growth after allowing for heterogeneous country effect. The causality test confirms the presence of long-run and short-run bi-directional causality between openness and economic growth. It also confirms the presence of unidirectional causality from economic growth to FDI, but not vice versa. At individual level, FDI was found to cause economic growth on Australian economy only. The conclusion was that economic growth may harm openness and foreign direct investment in the three countries investigated.
Sridharan, Vijayakumar and Chandra (2009) studied the causal relationship between Foreign Direct Investment and Growth in the BRICS countries (Brazil, Russia, India, China and South Africa). The study used quarterly data from 1996 to 2007 for Brazil, 1994 to 2007 for Russia, 1992 to 2007 for India, 1999 to 2007 for China and 1990 to 2007 for South Africa. The study employs the Industrial Production Index (IPI) as a measure of economic growth. Johansen’s cointegration model and vector error correction model (VECM) were used as estimation techniques. The empirical results found that Growth leads to FDI bi-directionally for Brazil, Russia and South Africa and FDI leads Growth uni-directionally for India and China respectively.

Jyun-Yi and Hsu (2008) examined the effect of foreign direct investment on economic growth. Threshold regression techniques developed by Caner and Hansen (2004) formed the basis of the study. The sample of the study covers 62 countries from both the developing and developed world for the period from 1975 - 2000. Initial GDP, human capital and the volume of trade were used as threshold variables. Under the threshold regression, initial GDP and human capital were found to be important factors in explaining FDI. FDI was found to have a positive and significant impact on growth when host countries have better levels of initial GDP and human capital.

Using sector specific FDI inflows for China and Vietnam over the period 1985-2002 and 1990-2002 respectively, Vu, Gangness and Noy (2006) investigated on the impact of FDI on economic growth and on labour productivity. With the exploration of the augmented production function specification and regression methodology, they conclude that FDI has a positive and direct impact on economic growth as well as an indirect effect through its impact on labour productivity.

Using a panel data set for 27 transition economies over the period 1991-2004 as well as the methodology of panel cointegration and dynamic ordinary least squares, Apergis, Lyroudi and Vamvakidis (2006) investigated on the importance of foreign direct investment on economic growth. Variables in the study were GDP, FDI, Exports and Education. The empirical findings show that FDI does not exhibit a significant relationship with economic growth. This applied to the transition countries that are characterized by high levels of income and have implemented successful privatization programmes.
Ravenhill (2005) studied the impact of FDI into the Korean Automobile industry. The study examined the factors driving FDI into the industry and the subsequent impact on car makers and auto parts suppliers. The results of the study found out that investment in the auto parts industry has been lagging behind but has increased in recent years as many foreign firms have injected money through joint ventures. However constraints such as labour market flexibility and trade union militancy have a significant negative impact on employment creation and economic growth.

Caner and Hansen (2004) carried out an estimation of threshold regression using the data- sorting method on instrumental variables for the period 1975-2000. The study was done in light of major advancement in threshold estimation following previous works of Huang and Chang’s (2004). The study was done on a cross sectional study of 62 countries selected from developed countries in Europe, America and some parts of Asia. The results of the threshold regression show that FDI can promote economic growth when the host country has achieved a certain threshold of development, initial GDP and human capital. This is perhaps indicative of the recipient countries learning and/or benefiting from foreign investors.

Choe (2003) utilize a panel VAR model to explore the interaction between FDI and economic growth in eighty countries mostly in Europe, America and Asia for the period 1971-1995. He finds evidence of Granger causality relationship between FDI and economic growth. The evidence is plausible in either direction, however stronger effects were visible from economic growth to FDI rather than the opposite.

Carkovic and Levine (2002) assessed the relationship between FDI and economic growth for 72 countries, mostly developing and developed countries in Europe and America over the period 1960-1995. They used the Generalized Method of Moments (GMM) panel estimator to determine the impact of FDI inflows on economic growth. Their results indicated that for both developed and developing economies, FDI inflows did not exert an independent influence on economic growth.

Lyroudi, Papanastisiou and Vamvakadis (2004), investigated on the effects of Foreign Direct Investment (FDI) on economic growth, mainly focusing on the transition economies from US and Western Europe. Bayesian econometric technique was employed for the period 1995-1998. The results indicated that FDI does not exhibit any significant relationship with economic growth for the transition countries.
2.4.2 Studies on Developing Countries
Louzi and Abadi (2011) used FDI-led growth hypothesis in testing the effect of foreign direct investment on economic growth in Jordan. The vector error correction approach from 1990-2009 time series data was used to generate an econometric model that captures two way linkages between variables of interests. Results from the study show that FDI inflows do not exert an independent influence on economic growth.

Khaliq and Noy (2007) investigate the impact of foreign direct investment on economic growth using detailed sectoral data for FDI inflows to Indonesia over the period 1997-2006. Using the methodology of augmented production function specification and regression methodology with time fixed effects, they concluded that in the aggregate level, FDI has a positive effect on economic growth. However, when accounting for the different average growth performance across sectors, the beneficial impact of FDI was considered to be no longer apparent. When examining different impacts across sectors, estimation results showed that the composition of FDI matters for its effect on economic growth. Few sectors reflected a positive impact of FDI and one sector even showed a robust negative impact of FDI on economic growth.

Using cross-section regression for 71 developing countries, Alfaro, Chanda, Ozcan, and Sayek, (2006) examined whether economies with well-developed financial markets are able to benefit and increase their economic growth with the attraction of FDI. They argued that the lack of development of the domestic financial markets can reduce the domestic economy’s ability to benefit from potential FDI spill-overs. Data from IMF “Financial Statistics” (2000) was used for net FDI inflows. For economic growth, growth rate of output measured as the growth of real per capita GDP in constant US dollars was used. The data was obtained from World Development Indicators (2000). A calibration exercise was contacted between theoretical and empirical literature. The results indicated that in most of the 71 developing countries in the sample, FDI had a negative effect on economic growth. Thus confirming their hypothesis that insufficiently developed financial markets and institutions can diminish the positive effects of FDI.

Alfaro (2003) in Lyroudi et al, (2004) used cross-country regression and time series data for the period 1981-1999 to examine the effect of foreign direct investment on growth in primary, manufacturing and service sectors. Alfaro found out that FDI plays a positive role in economic growth. These effects emanates mainly from the manufacturing sector.
Effendi and Soemantri (2003) contacted a panel data study on foreign direct investment and regional economic growth in Indonesia. Time series data was used from the year 1987-2000 to generate an econometric model from 26 provinces in Indonesia. The Generalized Least Squares method was used as an estimation technique. Findings of the study are that FDI has positive and significant effect on regional economic growth in the short-run but not in the long run.

Kohpaiboon (2003) introduced the export variable in the growth- FDI equation when examining the effect of foreign direct investment on economic growth in Thailand. The vector error correction approach using data from 1970 to 1999 was used to generate the econometric model. Kohpaiboon found that a unidirectional causality from FDI to GDP existed and that the impact of FDI on growth tends to be greater under an export-promotion trade regime compared to an import substitution regime.

Using the investor surveys approach and econometric techniques, Obwona (2001) investigated the relationship between FDI and economic growth for Uganda and the determinants thereof. Pull factors such as growth prospects, liberalized exchange rate, low inflation and fiscal discipline were regarded as important variables in attracting foreign direct investment. However, the importance of each of the variables depended on the type of investment and motivations or strategy of investors (Obwona, 2001:62). The surveys approach was used in collating data from local and foreign investors in regard to their decision and decision making process when investing in Uganda. Productive investment was proposed to be the main focus of the study. Findings from the survey showed that foreign investors were concerned with the level of security in terms of a stable macro-economic and political environment and credible policy reforms. This implies that increased foreign investment was a result of stable investment environment provided by government through its policies and institutions (Obwona, 2001:56).

Econometric tests were also carried on time series data for the period from 1975-1991. This was done in order to estimate the determinants of FDI on growth. In development of the econometric model, the FDI equation was specified with FDI as the dependent variable, GDP growth rate, trade balance, inflation rate, savings rate and external debt as explanatory variables. The results showed that all coefficients had positive signs. However only GDP growth, market size and trade balance were significant (Obwona, 2001:63). Using both results from the surveys approach and the econometric tests, Obwona (2001:62) noted the existence of a positive relationship between foreign direct investment and economic growth in Uganda.
2.4.3 Studies on South Africa

Moolman et al, (2006) investigated the macroeconomic link between foreign direct investment in South Africa, and its resultant impact on potential output. Cointegration techniques and time series data from 1970 to 2003 were utilized to construct a model suitable for policy analysis. Five variables were explored as explanatory variables for FDI in the model. They include real exchange rate, with the rand-dollar exchange, real GDP as a measure of market size, infrastructure, openness to trade and a dummy variable of sanctions. Empirical results indicated that market size, openness and infrastructure are factors on which South African policy makers should focus when seeking to attract foreign direct investment. Thus also in this regard, there was found to be positive and significant results on the effect of FDI on economic growth.

Fedderke and Romm (2004) studied growth impact and determinants of Foreign Direct Investments in South Africa using the vector error correction model. The primary objective of the study was to provide a structural analysis of the growth impact of FDI in South Africa and its determinants. The study used aggregate time series data in South Africa for the period 1960 to 2002. The empirical results show that growth impact of FDI is positive in South Africa, thus confirming the positive spill-over effect of foreign capital on output in South Africa. While there is a crowd–out of domestic investment from foreign direct investment, this impact is restricted in the short run.

2.4.4 Assessment of Empirical literature

Empirical literature on the effect of foreign direct investment on economic growth is limited, especially in South Africa. However, vast literature has been done outside South Africa. Table 2.1 provides a summary of the empirical literature and a guide for selecting variables to be tested in the empirical analysis. Studies by Choe, (2003), Arpegis et al, (2006), Borensztein et al, (2009), Fedderke and Romm, (2004) and Moolman et al, (2006) amongst others provide guidance on the theoretical and empirical framework to follow. The studies mentioned above are from different countries, uses different techniques but the variables used in their respective empirical models are similar. The variables that have been empirically found to have a positive relationship with economic growth (GDP) include FDI, employment, exports, productivity, domestic investment, education, political stability, human capital and technology. Selected variables that have been found to have a negative relationship on GDP are interest rate, exchange rate, debt, imports, corporate tax rate and wage costs.

Table 2.1 Summary of Selected Empirical Literature of FDI Effect on Economic Growth

<table>
<thead>
<tr>
<th>AUTHOR(S)</th>
<th>COUNTRY(S)</th>
<th>PERIOD</th>
<th>METHODOLOGY</th>
<th>VARIABLES</th>
<th>FDI EFFECT ON ECONOMIC GROWTH</th>
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<tr>
<td>Jyuni-Yi and Hsu, (2008)</td>
<td>62 countries</td>
<td>1975-2000</td>
<td>Threshold Econometric tests</td>
<td>Initial GDP, FDI, Human Capital, Volume of trade</td>
<td>Positive and significant (with better levels of initial GDP and economic growth)</td>
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<td>Crowd out of domestic investment from foreign capital in the short-run</td>
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<td>Indirect effect through its impact on labour productivity</td>
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<td>Labour employment</td>
<td>Negative effect (across sectors)</td>
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Source: Own summary from selected empirical literature

2.5 Concluding Remarks

The main objective of this chapter was to review literature on economic growth and foreign direct investment. It is evident from the empirical review that many factors are important in attracting foreign direct investment by host countries but with different significance. Studies from developed countries, developing countries and South Africa have been useful in unearthing the real effect of foreign direct investment on economic growth. Growth theories which include Harrod-Domar growth model, neo-classical growth theory and the new endogenous growth theory where reviewed in the chapter. The new endogenous growth theory was found to be compatible with the present day world in terms of human capital and technological development, thus formulating the basis for the empirical evidence.

The chapter also reviewed two FDI theories, the eclectic theory and the industrial organisation theory. The main insight from these theories is that the main reason why investors invest abroad is because of the location advantages, country specific advantages (where to locate?), ownership advantages (why go abroad) and internationalisation (how to go abroad). The country specific advantages portray that investment in a foreign country goes far beyond the firm specific advantages as it looks at the political environment, availability of raw materials, language and cultural differences, government regulations as well as the performance of the economy. Thus in this regard, understanding the specific ownership, internalization and locational advantages of trans-national companies facilitates in the comprehension of the behaviour of firms as countries seek to attract the right kind of foreign investment.

The next chapter provides an overview of FDI inflows and economic growth in South Africa.
CHAPTER 3

OVERVIEW OF SOUTH AFRICA’S FDI INFLOWS AND ECONOMIC GROWTH

3.1 Introduction

This chapter reviews trends in FDI inflows and economic growth for the period 1980 -2010. The chapter is divided into six sections. The first section gives the general background on FDI in South Africa. The following section provides historical trends on FDI from international, regional and local perspectives. The third section discusses the determinants of FDI in South Africa, followed by an overview of economic growth in South Africa. Factors affecting economic growth apart from FDIs are discussed in section five. The sixth section concludes the chapter.

3.2 Historical Overview of Foreign Direct Investment in South Africa

South Africa is a developing country and depends heavily on investment for its continued growth. The injection of investment funds (FDIs) from abroad is essential to ensure the proper operation of the country’s vast natural resources, which in turn enhance the continued growth of the economy. According to Asiedu, (2002), the quality and quantity of foreign investment flowing into South Africa depends upon the returns that investors expect and the uncertainties around those returns. These expectations can be categorized as follows;

Firstly there is a set of macro or country level issues concerning economic and political stability and national policy towards foreign trade and investments. Secondly, there is the set- back of efficiency of a country’s regulatory framework. As far as firms in the manufacturing industry are concerned, the set back of efficiency of a country’s regulatory framework relates to the entry and exit, labour relations and flexibility in labour use, efficiency of transparency of financing and taxation, and efficiency of regulations concerning the environment safety, healthy and other legislatives public interests. Thirdly, the important expectation is the quality and quantity of available physical and financial infrastructure, such as power, transport, telecommunications, banking and finance.

As far as these expectations are concerned, Asiedu (2002) reiterated that South Africa performs quite well.
The investment climate in South Africa has changed dramatically over the years. In the 1970s and 1980s, South Africa’s foreign trade and investment was heavily influenced by sanctions and boycotts. The sanction and campaigns against apartheid resulted in low investment to South Africa, or even disinvestment. Domestic investment which was based on import substitution, took centre stage compared to Foreign Direct Investment (Gelb, 2002). The investment climate changed in 1994 when the first democratically elected government came into power. The country became politically stable with a more open and outwardly oriented economy. The manufacturing sector has seen the greatest destination of investment by EU manufactures over the past decade, followed by US and Japan (Hamouch and Rumney, 2005). The gas and oil industries have also attracted large amounts of foreign investment between 1994 and 1999 while investment in the mining sector has been much stronger since 2000 (Hamouch and Rumney, 2005).

The strong growth of FDI in the manufacturing industry in South Africa has been the result of well-designed and well managed government policies, particularly in the motor industry. Thus in 2002, the automotive sector was the third largest sector in South Africa’s economy (after mining and financial services) measured by its percentage contribution to the GDP of the country. From 2002 to 2010, there has been a shift in sector contribution of FDI to the economy of the country. Green-field projects in sectors such as information technology attracted more FDIs than the historic mining sector thus suggesting a change in FDI motives from natural seeking FDIs to market and efficiency seeking FDIs (SARB, 2011).

3.3 Analysis of Global, Africa and South African FDI Inflows

3.3.1 Global FDI Inflows

According to WIR (1995:42), global FDI inflows have been fluctuating between developed and developing countries. Developed countries have traditionally received a large share of FDI inflows since the 1980s. This has however gradually reduced over time. During 1982-1986, developed countries’ share was 70 per cent whilst 30 per cent was for developing countries. By 1994, the developed countries’ share of FDI had been reduced to 60 per cent whilst the share of the developing countries’ increased to 40 per cent. In 1991 and 1992 global FDI figures recorded low figures of US$115 billion and US$111 billion respectively. There was a gradual increase in FDI to developing and emerging economies of US$125 billion in 1993 and US$135 billion in 1994. This increase has been attributed to an increase in privatisation across regions (WIR 1995:42).

Since then, global FDI increased considerably to US$648 billion in 2004 and US$916 billion in 2005. This has been attributed to increased cross-border mergers, acquisitions and participation of companies (WIR, 2006:2-6).

The WIR (2006:2) reports that UK and the Asian countries were the largest recipients of FDI in 2005 and 2006 respectively. The growth in FDI for Asia has been attributed to various policy changes at national and regional levels. For example China signed an agreement to establish a free trade area by 2010. Furthermore, free trade agreements were signed by Asian countries particularly with the United States and the Association of Southeast Asian Nations (ASEAN) (WIR, 2006:3).

According to WIR (2011:2), there were fluctuating figures in FDI inflow from 2007 to 2011. In 2007 FDI was recorded at US$1.097 billion, followed by a decline of -5.4 per cent to $1.038 billion in 2008. The year 2009 saw a recovery of US$1.184 billion in 2010 and US$1.231 billion in 2010. Regardless of the great averages in world FDI flows, there was an uneven pattern between regions and also between sub-regions. Figure 3.1 below adapted from WIR (2011:3) will be used to show this analysis.
Developed countries have traditionally received the greater share of FDI inflows since the 1980s. This has however been reduced slowly over time.

From the year 1982 to 1986 developed countries share was 70 per cent whilst 38 per cent was for developing countries and 2 per cent for transitional economies. By the year ending 1994, the developed countries share of FDI has been reduced to 60 per cent and it fluctuated around these ratios until the year 2006, whilst the proportion of transitional economies gained to more than 5 per cent of the world FDI (WIR, 2006:4).

According to WIR (2011:3), from the year 2007 to 2010 FDI inflows to developed countries contracted. This is in contrast to developing and transitional economies which for the first time surpassed the 52 per cent mark of global FDI flows.

This has been attributed to the strength of domestic demand and the increase in cross-border mergers and acquisitions due to attractive valuations of company’s assets, strong earnings growth and robust economic indicators such as market growth (WIR, 2011:3).

### 3.3.2 Africa’s FDI Inflows

According to UNCTAD (2010), Africa’s share of the global stock of FDI declined from about 5.3 per cent in 1980 to about 2.3 per cent in 2000. Despite the fact that FDI has eventually increased for developing countries after the year 2000, Africa’s share on a global scale has remained retarded. A
consistent pattern of below 3 per cent has been visible in the year 2003 and 2004. For the year 2005 there was a sharp increase of about 182 per cent. In this increase South Africa was entitled to 21 per cent. This was attributed to the acquisition of ABSA (South Africa) by the Barclays Bank (UK) (WIR, 2006:6).

FDI inflow to Africa has been dominated by the OCED countries, which accounted for 83 per cent of FDI inflows from 2005 to 2010. China and India make up to 3 per cent of African FDIs. The other 14 per cent was shared between intra–African investments and the Middle East (IMF, 2011:9).

During the period from 2007 to 2009, 60 per cent of investment in Africa was concentrated in South Africa, Egypt and Nigeria. The key investors have been OECD companies in the extractive industries from United Kingdom, France and the United States (WIR, 2011:7).

South Africa has been a vital source of intra-African FDI. Its outward FDI stock in 2008 was at 22 per cent. The incidence of the global financial crisis has however retarded the growth to less than 10 per cent in 2009 and 2010 respectively. Morocco was also regarded to be a large source of intra-African FDI. In 2010 Morocco held 55 per cent of its outward FDI in North Africa and 84 per cent in Tunisia (WIR, 2011:88). Thus intra- African FDI is regarded as a driver of regional integration and structurally balanced economic development in Africa.

According to WIR (2011:90), inward FDI has mainly been in the extractive sector, which is the primary sector. This is a reflection of the investment in oil and mineral extraction. Angola, Equatorial Guinea, Nigeria, Egypt, Sudan and South Africa accounted for almost more than half of all inflows coming to Africa. Other forms of FDI in Africa have been through several mergers and acquisitions concluded in the mining industry, banking sector and service sector. In the case presented in IMF (2011:22), it was reported that sustained efforts to promote political stability and macroeconomic reforms where important elements responsible for increase in foreign direct investment in Africa.

3.3.3 South Africa’s FDI Inflows
According to DTI (2009:44), South Africa has an open investment climate and Foreign Direct Investment has played a crucial role in the development of its economy. Since the end of apartheid, South Africa has undertaken substantial economic reforms in order to attract more FDI. However this has not been realised. Since 1980, FDI has remained low in relation to other growing market economies. The implication has been attributed to high levels of unemployment, lack of skilled
manpower, the incidence of HIV/AIDS, to a less extend and bureaucracy from the Government side (IMF, 2011:6). The later include issues such as difficulties in securing work permits for managers and professionals and the waiting thereof, cost and hassle factors of compliance with labour legislation and inadequate investment incentives amongst others.

Figure 3.2 below the total amount of foreign direct investment inflows in South Africa for the period from 1980 to 2010.

**Figure 3.2 Foreign Direct Investment Inflow in South Africa (1980-2010)**

![Graph showing South Africa's Total FDI Inflow from 1980 to 2010](image)

Source: Own graph with data adapted from (SARB, 2011)

In the graphical illustration shown above, South Africa received very little inward FDI which fluctuated below R33 million during the period from 1980 to 1994. This has been attributed to the disinvestments of the 1980’s emanating from the political isolation of the apartheid regime (Business Map, 2002:1).

In 1994 however, there was a gradual increase in FDI from R33 million in 1994 to R1.3 billion in 1995 and subsequently R3.5 billion in 1996. This has been as a result of political democratization and subsequent openness of the economy to trade (Business Map, 2002:2).

1997 showed a remarkable increase of R17.6 billion of FDI inflow. This has been a reflection of partial privatization of Telkom and South African Airlines (Thomas and Leap, 2005:9).
Between 1998 and 2000, FDI fluctuated between R3.1 billion in 1998, R9.1 billion in 1999 and R6 billion in 2000. A marked increase was however visible again in the year ending 2001, with a record level of R58.4 billion. This came about due to the buy-out of De Beers minority shareholders by (London Stock Exchange listed) Anglo American and the sale of a strategic stake in Telkom, which was a wholly government owned monopoly. The deal saw the Thintana consortium paying around US$1.2 billion for 30 per cent share in Telkom (Business Map Foundation, 2005:3).

The FDI inflow nonetheless dropped in the preceding years to R944 million in 2002 and R824 million in 2003 respectively. A slight recovery of R5.1 billion in 2004 was followed by a massive increase of R39.7 billion in 2005. This was as a result of a R33 billion acquisition deal of ABSA (SA) by Barclays (UK) (WIR, 2011:44).

The FDI inflow for 2006 was negative at –R3.4 million. It bounced back in the following year at fluctuating levels of R7.1 billion in 2007, R6.3 billion in 2008 and R7.2 billion in 2009. This increase has been attributed to the (FIFA 2010) Soccer World Cup. However, it was less than anticipated due to the incidence of the global financial crisis during the latter part of 2008 to 2009 (SARB, 2011).

The year 2010 posted a positive FDI inflow of R10.2 billion. This gain has been attributed to South Africa’s integration into the BRICS (Brazil- Russia- India- China- South Africa) initiative in December 2010.

3.4 Sectoral Analysis, Sources and Determinants of FDI in South Africa

3.4.1 Sectoral Analysis of FDI in South Africa

According to UNCTAD (2012:6), by industry during the period 2001-2010, the primary sector accounted for 36.3 per cent of inward FDI stock, with mining and quarrying representing 36.1 per cent of the total. The services sector attracted 36.2 per cent. This was mainly in finance, accounting for 27.5 per cent. The other components of the service sector included transport, storage and communications which accounted for 4.5 per cent, trade 3.7 per cent and construction 3.4 per cent. Community, social and personal activities together with electricity and other services such as water and gas attracted very little FDI with a percentage share of close to zero. The manufacturing sector was the lowest contributing sector, attracting 27.5 per cent of inward FDI stock during the same period.
WIR (2011) reports that the emergence of the financial sector as an attractive investment sector is mainly credited to political emancipation, subsequent liberalization of the sector and investor confidence.

South Africa has also attracted green-field projects in sectors such as motor vehicles, pharmaceuticals, food-processing, information technology and beverages. This trend could suggest the possibility of a shift in FDI motives, from natural resource seeking to market and efficiency seeking FDI (UNCTAD, 2012).

3.4.2 Sources of FDI Inflows in South Africa
UNCTAD (2012:7) presented an analysis of regional sources of FDI in South Africa for the period 2001-2010. The analysis shows Europe as the largest source of FDI in South Africa, followed by America, Asia, Africa and Australia. Total inward FDI stock from Europe amounted to R4 758 177 million accounting for 84.2 per cent of total inward FDI from all regions. It is followed by America with R395 620 million accounting for 7 per cent and Asia R241 363 million accounting for 4.3 per cent. Africa and Australia showed very little contribution to total inward FDI stock. Africa accounted for 0.9 per cent of the share which amounted to R50 725 million, and Australia accounted for 0.2 per cent of the share amounting to R 8 827 million.

Figure 3.3 presents the regional sources of FDI to South Africa and their contribution to the total inward FDI stock.
The top five sources of inward FDI from individual countries were mainly from UK, which accounted for R 3 487 478 million (61.7 per cent), followed by Netherlands R422 507 million (7.5 per cent), US R385 115 million (6.8 per cent), Germany R364 371 million (6.6 per cent) and Switzerland R173 684 million (3.1 per cent) (UNCTAD, 2012:7).

The dominance of the EU as a major source of investment was due to South Africa’s Multinational companies domiciled in the UK, and preferential access to the UK market through free trade agreements (WIR, 2011:188). The growth share in the US has been attributed to the African Growth and Opportunity Act (AGOA), which came into force in November 2000. The latter has attracted some FDI into textile manufacturing, particularly in the Eastern Cape (WIR, 2011:189). In the case of Netherlands and Germany, mergers and acquisitions where the main factors responsible for the respective R422 507 million and R364 371 million of total inward FDI recorded between 2001 and 2010 (SARB, 2011).
3.4.3 Determinants of FDI in South Africa

3.4.3.1 Infrastructure
The availability of good infrastructure is crucial for attracting FDI regardless of the type of FDI. It is often stated that good infrastructure increases the productivity of investment and therefore stimulates FDI inflows (Asiedu, 2002). Expanding new economic infrastructure and maintaining existing facilities are important components of an investment climate reform strategy.

The government has, therefore committed significant resources to infrastructure development so as to improve the quality and sustainability of capital projects and the overall efficiency, competitiveness and growth of the economy. South Africa’s manufacturing industry is a world leader in several specialized sectors, including railway rolling stock, synthetic fuels and mining equipment and machinery (Asiedu, 2002).

3.4.3.2 International Reserves
International reserves greatly influence the flow of capital in developing economies. International reserves are mainly regarded as main determinants of how good or bad the investment climate is in a country (Asiedu, 2002). High levels of international reserves boost investor confidence and therefore attract foreign investors whilst lower levels of international reserves have the opposite effect.

3.4.3.3 Natural Resource Availability
Natural resource availability is another factor not to be overlooked in attracting foreign investments. Investors looking for resources tend to locate their subsidiaries abroad where a regular, stable or cheaper supply of inputs such as raw materials and other energy sources are easily transported to their base (Jenkins and Thomas, 2002). Countries that have large oil deposits and mineral resources are favoured by investors because of lower production costs. South Africa falls under the category of countries that have abundant natural resources.

3.4.3.4 Return on Investment
In general, FDI goes to countries that pay a higher return on capital. For developing countries, testing the return on investment is difficult because most developing countries do not have a well-functioning capital market (Asiedu, 2002). What is often done is to use the inverse or real GDP per capita to measure the return on capital. The implication of this is that all things being equal, investments in countries with higher per capita income should yield lower return on capital and therefore GDP per capita should be inversely related to FDI (Asiedu, 2002).
Foreign investors may be attracted to countries and industries with an existing concentration of other foreign investors. In this case, the investment decision by other countries is seen as a good signal of favourable conditions. The term “agglomeration economies” is often applied to this situation (Campos and Kinoshita, 2003). The clustering of foreign investors leads to positive externalities. Three types of such externalities have been identified. The first is that technological spill overs can be shared among foreign investors. Second, they can draw on a share of skilled labour and specialised input supplies. Finally, they can share benefits on marketing and advertising.

3.4.3.5 Political Stability
A stable political environment attracts more FDI than an unstable one. Less democratic countries have little respect for the rule of law and political rights. These instances can shun foreign investors. In conditions when governments change, foreign investors would want to be certain that such changes will not affect their investments and businesses in general (Onyeiwu and Shrestha, 2004).

3.4.3.6 Fiscal Incentives
According to Lim (2001:13), fiscal incentives increase the host country’s location advantages. These incentives could be in the form of lower corporate tax rates, lower import and export duties or specific concessions such as tax holidays. These are linked with FDI related policies to attract FDI policies, thus a positive relationship ensues. Industrial development zones (IDZs) developed by the Department of Trade and Industry (DTI) in South Africa provide fiscal incentives in the form of tax holidays and free imports of raw materials in order to encourage export-oriented manufacturing (Streak 1998:6).

3.4.3.7 Financial Development
Deeper financial markets may allow foreign firms to finance short and long term transactions more easily and meet capital needs in the local market. The financing could be in the form of access to credit from the banking sector or through the use of debt instruments in the financial markets. The more developed the financial sector is, the more FDI potential the country would attract (Ahmed, Arezki, and Funke, 2005:9).

3.4.3.8 Market Size
Market seeking FDI requires a large market for efficient utilization of resources. As the market size of a country grows, inward FDI will also increase as more goods and services can be produced. The large market size reduces the cost of production because of lower fixed costs and economies of scale. Investors are keen to invest in a growing economy where they can benefit from economies of
scale and efficient utilization of resources from the large market size. Hence a positive relationship is expected between market size and FDI (Lim, 2001).

3.4.3.9 Openness
Openness of a country is the ratio of net exports to the GDP of the country shown by the degree to which investors can move large sums of money in and out of a country. Less capital controls and liberal trade policies can encourage FDI whilst restrictive policies can deter FDI. As is the case of South Africa, little FDI was received during the apartheid era as the country was less open to the rest of the world with a number of capital controls. With the advent of democracy capital controls were relaxed hence FDI was encouraged (Onyeiwu and Shrestha, 2004:9).

3.5 Overview of Economic Growth in South Africa

Before the advent of democracy in 1994, South Africa experienced falling investments and economic growth. This was due to political isolation and economic sanctions from the rest of the world (Nowak, 2005:2). The end of the apartheid era revived the country’s economy. This is evidenced by the increase in real GDP to 3.2 per cent from an average of 1.5 per cent prior to the advent of democracy from the period from 1980 to 1994 (Nowak, 2005:2).

Macroeconomic policy reforms such as the Growth Employment and Redistribution (GEAR) implemented in 1996 entailed the liberalisation of markets, private sector participation and the integration of the economy with the rest of the world. These reforms led to an increase in real GDP growth from an annual average of 4.3 per cent in 1996 to 5.1 per cent in 2007 (HDR, 2009:25).

In 2004, there was diversification from commodities specialisation to service sector specialisation. This saw the advent of the Accelerated and Shared Growth Initiative South Africa (ASGISA) in 2004, which was made in an aim to increase economic growth above the 6 per cent mark by 2010 (IMF, 2006:5).

HDR (2009:15) asserts that the lowest budget deficit of about 0.5 per cent was recorded in 2005/2006 fiscal year. The highest budget surplus of 0.6 per cent of GDP was recorded in the fiscal year 2007/2008. This increase in real GDP growth rate has been attributed to strengthening public finances, increased productivity and supporting external environment. However, growth rate have remained below 6 per cent owing to low levels of fixed investment.
The incidence of the financial crisis for the 2008/2009 fiscal year, also saw the country’s real GDP growth falling to an average of 3.5 per cent in 2008 and negative 1.7 per cent in 2009 before a recovery of 2.8 per cent in 2010 (SARB, 2011). The increase in annual Real GDP growth for 2010 was driven primarily by a steady recovery in consumer spending partially attributed to the FIFA world cup, strong commodity prices, low interest rates and faster global economic growth (SARB, 2011).

Data tabulated from SARB (2011) is illustrated in Figure 3.4 to show the trends in South Africa’s real GDP from the year 1980 to 2010.

**Figure 3.4 Real Gross Domestic Product (1980-2010)**

![Graph of South Africa's Real Gross Domestic Product (1980-2010)](image)

Source: Own graph with data adapted from (SARB, 2011)

From Figure 3.4 it can be noted that real GDP was somehow very volatile in the 1980s though it generally increased from R935 617 million to R1 090 366 million in 1980 and 1989 respectively, reflecting a 16.54 per cent increase. However, real GDP fell to R981 994 million in 1982 from R985 773 million in 1981 and further decrease by 1.85 per cent in 1983. This was mainly due to the fact that the economy was dominated by low-productivity and low-employment as a result of that domestic industries faced low competition from international firms due to high protectionism. In other words domestic firms could not strive to increase productivity efficiently due to low import competition hence reducing the gross output of the country. The country’s real GDP boosted in 1984 by 5.10 per cent to R1 013 009 million from R963 861 million in 1983. However, the increase was short-lived because by 1985 real GDP had decreased by approximately 1.21 per cent. Such
variability in the South Africa’s real GDP was a direct link of the debt crisis for 1983, in the form of short-term foreign debt which led to the country facing financial shortages hence leading to the weakening of the Rand. This had a direct negative impact on the production and consumption levels of the South Africans (Flatters and Stern, 2007).

From 1985 to 1989, the South African real GDP experienced sustained expansion and reached R1 090 366 million by 1989. The prolonged increase in real GDP for that period was closely related to the efforts of the SARB to stabilise the Rand in relation to other currencies, this directly led to stability in the economy thereby maintaining positive terms of trade. The country’s real GDP, declined in the early 1990s, with real GDP declining with more than 2 per cent to R1 052 848 million in 1992 from R1 086 901 million in 1990. This was a direct result of the tightening political situation, dominated by strikes, go slows and employee grievances which negatively affected productivity (Edwards and Lawrence, 2006).

Real GDP increased by 1.23 per cent from R1 052 843 million in 1992 to R1 065 830 million in 1993. Furthermore, gross output for South Africa continued to increase after 1994 up to when the negative effects of the global financial crisis were felt in 2009. In other words South Africa experienced the longest period of economic expansion in the country’s recorded history between 1992 and 2008 (SARB, 2011). Increases in real GDP were sustained due to the attainment of democracy by the country in 1994. This created an environment which reduced risk, hence creating investor confidence to invest in the country. On the same note, the South African government also embarked on prudent fiscal and monetary policy such as the announcement of the adoption of the inflation targeting strategy by the SARB in the 2000-2001. Nattrass, Wakeford and Muradzikwa (2000: 233-234), explain that through the use of rational expectations, inflation targeting policy has been used successfully to reduce inflationary expectations that might directly translate into inflation thereby stabilizing the economy, the exchange rate and boosting investor confidence.

On the contrast, South Africa’s total output decreased by more than 1.5 per cent to R1 786 637 million in 2009 from R1 814 532 million in 2008. Sluggish growth experienced by the country in 2009 was a result of many factors which included, the depreciation of the Rand, the credit crunch and the global financial crisis of 2008, which directly led to increased oil prices thereby increasing costs of production. These implications, coupled with a deteriorating global environment persisted in 2010. This resulted in a lower real GDP growth of 2.89 per cent in the same year (Naude, 2009).
3.6 Factors affecting Economic Growth in South Africa

This section discusses other factors apart from FDIs affecting economic growth in South Africa, as postulated in the methodology of the study. The factors selected include domestic investment, exchange rate and external debt.

3.6.1 Private Sector Investment/ Domestic Investment

Since the 1980s the South African government has implemented various incentives such as lowering interest rates, tax holidays, various treaties and initiatives with the aim of increasing private investments in retrospect reducing unemployment and inducing economic growth (SARB, 2011).

Despite of these mechanisms, private sector investment in South Africa continued to grow at a lower pace. This is due to the fact that, South African corporations refrains from significant new projects developments in an environment of weaker business confidence, domestic supply constraints and low demand levels (SARB, 2011).

According to Fallon and De Silva (1994), private investment covers outlays by the private sector including private non-profit agencies on additions to its domestic assets. At individual level the private investments benefits businesses only, but when evaluated at national level, the impact is very remarkable for economic growth (Lloyd, 1999).

The increase in private investments in South Africa has been entailed by the extension of credit to the domestic private sector. This has been through loans, purchases of non-equity securities, trade credits and other accounts receivable that establish a claim for repayment (IMF, 2011). The ease of credit access has positive implications of boosting the private sector fixed capital stock (Borensztein, et al, 1998). Figure 3.5 presents the trends of credit extended to the domestic private sector for investments. This is for the period 1980 to 2010.
From the early 1980s to early 1990s, the private sector experienced very low levels of credit which were less than R20 000 billion. Such low investment levels were caused by a number of factors such as low confidence levels by investors to invest in the country due to political instability, economic isolation, and a bleak economic future that prevailed in the country due to high levels of uncertainty. Another, significant reason for such low levels of investment in the country was the low level of savings associated with the period between 1980 and 1990 (Barbour, 2005).

After 1994 credit extended to the private sector followed an upward trend to 2000. There was an increase of 237.3 per cent of credit extended to the private sector from R 11 372 billion in 1994 to R38 359 billion in 2000. A significant slump of R 18 572 billion was recorded in 2001, thus showing a decline of 13 per cent in credit extended to the private sector for investments as compared to the previous year. The slump has been attributed to the 2001 currency crisis, which however showed a recovery of R84 510 billion in 2003 before falling to R79 289 billion in 2004 due to low investor confidence (SARB, 2009). The preceding years of 2005 to 2007 recorded an overall increase of 19 per cent in credit extended to the private sector. This was from R81 493 billion in 2005 to R96 949 billion in 2007. The upward swing was persistent until 2010. Over the four year period from 2006 to 2010, more than 100 per cent of credit was issued. This was due to a fiscal incentive framework implemented by the government in order to encourage capital formation in
strategic industries and industries that would add value to South Africa’s abundant mineral resources, coupled with the outlays for the FIFA 2010 world cup. In this regard, a massive increase of R140 584 billion in credit was issued for private sector investments (SARB, 2011).

3.6.2 Real Exchange Rate
According to Nattrass et al, (2000:237) South African currency was pegged in relation to other currencies before 1973. During this period, major shocks in the form of significant gold price changes and political crises resulted in capital outflows and intensified trade sanctions, which complicated the management of the exchange rate. In 1979 greater flexibility was introduced into the foreign exchange market with a dual currency exchange rate system being used (Takaendesa, et al, 2006).

The dual currency exchange system however was abandoned in 1983 with the commercial rate determined in the market subject to direct intervention by the South African Reserve Bank. A second exchange rate, the financial rand, applied to most non-resident portfolio and direct investment. In 1983, the financial rand was abolished. Following the debt crisis which was caused by the refusal of American banks to roll-over South Africa short term foreign debt, the rand fell further in 1985. The Reserve Bank maintained a direct influence on the exchange rate through active intervention in both the spot and forward markets.

Currently the mission of the SARB is to protect the value of the rand hence it tries by all means to keep the value of the country’s currency reasonable. Due to the negative effects of the flexible exchange rate system associated with volatility, the SARB opted to use the managed float system. The managed float allows the currency to fluctuate under market conditions but allows the reserve bank to intervene in the market to minimise short run variability by adjusting the stock level of gold and foreign exchange reserves (Nattrass, et al, 2000:238). Due to the exchange rate system used, which was by nature volatile and unstable, movements in the South African currency in relation to other currencies were expected from time to time.

Since the 1990s the SARB has adopted a non-interventionist policy in the foreign exchange rate market to complement the outward looking trade policy. The outward looking trade policy has ensured that export growth plays a critical role in promoting long-term economic growth. The flexible exchange rate brought about a lot of uncertainty and volatility in the exchange rate due to variability in market forces determining the exchange rates. In the 2000s, a lot of market participants
perceived the Rand to be weak and this further led to the weakening of the Rand. Figure 3.6 illustrates the movements of South Africa’s real effective exchange rate from 1980 to 2010.

**Figure 3.6 Real Effective Exchange Rate of the Rand (1980-2010)**

![Graph of South Africa's Real Effective Exchange Rate](image)

Source: Own graph made with data from (SARB, 2011)

From Figure 3.6 it can be observed that the real effective exchange rate was on average steadily appreciating from 1980 to 1984. There was however, a significant depreciation of the Rand’s real effective exchange rate in 1985 to 105.7 per cent from 135.25 per cent in 1984. The depreciation was driven mainly by the collapse in the nominal exchange rate. However, relatively high inflation in South Africa and large inflows of portfolio capital during the late 1980 led to the appreciation of the real exchange rate (Takaendesa, Tsheole, and Aziakpono, 2006).

From 1988, the South African Reserve Bank was more active in stabilising the real effective exchange rate, partly out of concern for the international competitiveness of South Africa’s manufacturing exports, and in particular to prevent excessive appreciation of the real exchange rate at times when the nominal exchange rate tended to appreciate. The real effective exchange rate index (on a 2000 base year) appreciated gradually from 96 per cent in the year 1988, to 104 per cent by the end of 1992, where after it depreciated to 97.18 per cent by the end of 1994 (Todani and Munyama, 2005).
Real effective exchange rate appreciated in the early 1990s, suggesting a relatively higher inflation rate and large inflows of portfolio capital in the country. With the lowering of inflation and speculative attacks in 1996, the exchange rate level fell drastically. Despite a disadvantageous real exchange rate between 1990 and 1992, South Africa’s exports grew. Decline in the REER increased the competitiveness of South African exports, resulting in significant increase in the exports of South African products. During 1993 to 1994 as the exchange rate depreciated, input prices dropped and foreign demand boomed therefore exports increased. This was in consistent with the ending of sanctions associated with the apartheid and the adoption of more outward oriented trade policies. The rand depreciated significantly started to depreciate from 1997 to 1998 attributing to the SARB’s selling of foreign reserves with the objective of reducing the currency crisis (Nattrass, et al, 2000:237).

The South African real effective exchange rate depreciated by approximately 25 per cent in 2001. The Rand depreciated against major currencies over this period, falling by nearly 27 per cent against the US dollar, 28 per cent against the Euro and 26 per cent against the British pound in real terms. The depreciation was caused by various adverse external and domestic developments leading to the deterioration in the country’s Balance Of Payments (BOP), hence the decline in the supply of foreign currency (Nattrass, et al, 2000:238).

Around October 2002, the rand strengthened reversing past trends. The currency’s appreciation was underpinned by the general dollar weakness, an improvement in global commodity price, particularly gold and platinum, favourable real interest rate, differential improved investor sentiment towards the emerging market, and the elimination of South Africa’s net open forward currency position. The Rand appreciated with 29 per cent against the Euro, 67 per cent against the US dollar and 35 per cent against the British Pound from 2002 to 2004 (SARB, 2009:36).

The rand marked a depreciating trend from 112.5 per cent in 2004 to 94.1 per cent in 2008. The period of this demise was largely comprised of oil shocks and the effect of the financial crisis on global markets. In the wake of the volatility of the exchange rate, foreign exchange regulations were amended to permit greater foreign investment by South African institutions. Stepped up foreign exchange purchases where permitted by the SARB to partially offset the upward pressure on the rand (SARB, 2009:40).
3.6.3 External Debt
External debt is considered by investors to be as a result of inappropriate macro-economic policies channelled in developing countries’ programmes (Obwona, 2001). Obwona (2001) further asserts that debt service burdens often reduce the ability of developing economies to provide basic infrastructures such as telephones, roads and electricity. As such, analyst expect an increase in a country’s debt/GDP ratio to negatively affect the flow of FDI to the country, while a decrease in the ratio would have the effect of attracting FDI (Chakrabarti, 2001). Chakrabarti (2001) adds that external debt burden limits the developing countries’ participation in the world economy, and the attendant debt servicing obligations manifest as impediment to economic growth and development.

Using Obwona (2001), and Chakrabarti (2001) suppositions, it can be argued that debt burden leads to a limited accumulation of capital (depletion of international reserves), and a limited application of flexible financing policies to consolidate small and medium sized firms. This indirectly affects employment, literacy and development.

According to Kearney and Quantec (2011), since 1980 South Africa has implemented several policy and non-policy initiatives meant to reduce external debt. Despite of all these mechanisms, the country is still faced with a scenario of borrowing in order to finance its debt obligations of public sector activities and non-financial public enterprises. In this regard, public sector borrowing requirements of more than R90 million is set each year in order to finance investment programmes of utilities such as Eskom and Telkom amongst other key priority projects. Figure 3.7 presents South Africa’s external-debt position from 1980 to 2010.
Figure 3.7 External Debt Position of South Africa (1980-2010)

From 1980 to 1984, South Africa maintained a stable debt position below R2 327 billion. In 1985, a major foreign debt crisis affected the country. This was due to the withdrawal of credit lines by a group of banks led by Chase Manhattan (Kearney and Quantec, 2011). As a result, there was a standstill on debt–repayment which resulted in an increase in external debt position of R2 754 billion in 1985 and R2 530 billion in 1986 respectively. The debt freeze was lifted in 1987 and 5 per cent of debt was repaid in the same year (Kearney and Quantec, 2011).

A key problem in the repayment of South Africa’s debt was that of appreciation of the rand as the dollar weakened. There was almost no external borrowing by South Africa from 1988 to 1990. This in retrospect made South Africa a net exporter. South Africa reduced its total disclosed foreign debt to R2 367 billion in 1992, down from R2 099 billion in 1991. Currency fluctuations caused an increase of R4 996 billion of external debt in 1993, and that figure continued to rise in 1994. External borrowing increased from R8 058 billion in 1994 to R9 610 billion in 1995.

Steps that have been taken since 1996 to reduce public debt and debt interests costs have provided a degree of flexibility that is essential to manage. This resulted in a steady increasing debt trend of R14 259 billion in 1996, R14 647 billion in 1997 and R15 482 billion in 1998.
An acute increase of national debt is adamant in the preceding years, to record R20 025 billion and R31 118 billion in 1999 and 2000 respectively. The spiralling pattern is persistent with a record of R66 619 billion in 2001 and R79 877 billion in 2002. The piling up of debt between 1996 and 2002 was enhanced by depreciation of the rand denomination against the U.S dollar, and the ease of access to credit by the national government due to several economic and trade agreements and subsequently end of an era of political isolation (Kearney and Quancet, 2011).

A fluctuating trend in external debt can be noted from 2003 to 2010. Though gradually increasing, a lower average increase of 22.4 per cent was recorded over this period. R72 617 billion was recorded in 2003, R64 207 billion in 2004, R68 787 billion in 2005, R80 326 billion in 2006, R77 608 billion in 2007, R99 171 billion in 2008, R88 088 billion in 2009 and R 88 926 billion in 2010. The low average increase in debt over this period came as result of better management of debt obligations by the national government (SARB, 2011).

3.7 Concluding Remarks

Despite the much praised establishment of sound macroeconomic fundamentals and on-going improvements in South Africa’s strategy of luring foreign investment, South Africa did not receive much FDI as its economic fundamentals justify (TISA, 2011). The blame has been shifted to undeniable socio-economic problems, such as high unemployment and the incidence of HIV/ AIDS.

Furthermore, the incidence of the financial crisis caused major investors such as the UK and US to withdraw their portfolio investments from the emerging markets. In this regard foreign investments were negatively affected.

The study established factors that investors should consider before investing in foreign countries. Market size and return on investment has proven to be the most prominent determinants of FDI, particularly those FDI flows that are market seeking. For developing countries like South Africa, testing the rate of return on capital is difficult because most developing countries do not have a well-functioning capital market. Skills of labour are identified as the major attractions of FDI. The cost of labour is important in location considerations especially when investment is export oriented. Openness, political stability, financial development, fiscal incentives and infrastructure were also found to be important determinants of foreign direct investment in South Africa.
An exploration of other factors affecting economic growth in South Africa was established in the last part of the study. Domestic investment, real exchange rate, and external debt were discussed. These factors have proven to be important in raising, and or deterring economic growth if they are not properly managed.

The next chapter presents the research methodology, model specification and estimation techniques.
CHAPTER 4

METHODOLOGY, MODEL SPECIFICATION AND ESTIMATION TECHNIQUES

4.1 Introduction

This chapter outlines the methodology applied to find the effect of foreign direct investment on economic growth. Theoretical underpinnings reviewed in chapter two forms the basis for this analytical framework. The first part of the chapter specifies the model and how estimation of the model was applied. This is followed by the specification of the data that was used, definition of variables and expected results. The following part of the chapter presents various tests for the model including stationarity, cointegration error correction and diagnostic testing. The last section outlines the concluding remarks.

4.2 Model Specification

The theoretical framework which underpins the methodology is based on the endogenous growth model as discussed in chapter 2. The model assumes that labour, human capital, physical capital as well as technological change are primary sources of growth. An augmented production function is employed in deriving the empirical model. The production function is presented as follows:

\[ Q = AL^\alpha K^\beta \]

Where:

\[ Q = \text{Total production (the monetary value of all goods produced in a year)} \]

\[ L = \text{Labour input} \]

\[ K = \text{Capital input} \]

\[ A = \text{Total factor productivity} \]

\( \alpha \) and \( \beta \) are output elasticity for labour and capital, respectively. These values are constants determined by available technology. Output elasticity measures the responsiveness of output to a change in levels of either labour or capital used in production.
For example if $\alpha = 0.15$, a 1% increase in labour would lead to approximately a 0.15% increase in output. If $\alpha + \beta = 1$, the production function has constant returns to scale. That is, if $L$ and $K$ are each increased by 10%, $Y$ increases by 10%. Thus $\alpha + \beta < 1$ implies that returns to scale are decreasing. If $\alpha + \beta > 1$ returns to scale are increasing.

Romer (1993:81) asserts that, if it is assumed that the number of researchers producing knowledge is constant, the model will predict that all growth is due to technological progress. That is to say the capital-labour ($K/L$) ratio, the stock of knowledge and output, all grow at a constant rate. Without technical progress, there will be no growth.

The underlying model will be modified by employing real GDP growth as the dependent variable as a function of foreign direct investment (FDI), Domestic Investment (INVE), Real Exchange Rate (EXCH) and Foreign Debt (DEBT).

This can be written as follows:

$$\text{RGDP}_t = f(\text{FDI}_t, \text{INVE}_t, \text{REXCH}_t, \text{DEBT}_t) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4.1)$$

Where:

$\text{RGDP}_t =$ Real Gross Domestic Product in year $t$

$\text{FDI}_t =$ Foreign Direct Investment in year $t$

$\text{INVE}_t =$ Domestic Investment in year $t$

$\text{REXCH}_t =$ Real Exchange Rate in year $t$

$\text{DEBT}_t =$ Foreign Debt in year $t$

The model to be estimated is expressed in logarithms as follows:

$$\log \text{RGDP}_t = \log (\beta_0 + \beta_1 \text{FDI}_t + \beta_2 \text{INVE}_t + \beta_3 \text{REXCH}_t + \beta_4 \text{DEBT}_t + \varepsilon_t) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4.2)$$

Where $\beta_1, \beta_2, \beta_3$ and $\beta_4$ are the coefficients to be estimated and $\varepsilon_t$ is the error term. The error term represents the influence of the omitted variables in the construction of the data.
4.3 Definition and Analysis of Variables

This section provides a discussion of variables and their justification in estimating the effect of FDI on economic growth. In employing measures on the effect of FDI on economic growth, the aim is to use proxies that have been used in most FDI literature, particularly in South Africa. This provides a basis for comparing results obtained. Market size, exchange rate and foreign direct investment are variables that have been found to be significant in past South African studies, thus forming the basis for the base model (Fedderke and Romm, 2004) and Moolman et, al, (2006). The base model was then extended by adding variables for which there was data.

The standard measure of the log of real GDP is used to measure market size (Moolman, et al, 2006). In most FDI estimations, FDI is usually measured as a ratio of nominal GDP (Ahmed, et al, 2005 and Asiedu, 2002). FDI can also be measured as a log of total FDI inflows (Fedderke and Romm, 2004). The preposition of Fedderke and Romm (2004) is employed.

Credit extended to the domestic private sector for all monetary institutions is used as a basis for domestic/private investment (INVE). This is adapted from Borenztein et al, (1998), Vu et al, (2006), Obwona (2001) and Khaliq and Noy (2007).

Real exchange rate (REXCH) is used to measure the effect of exchange rate on economic growth (Fedderke and Romm, 2004). Total loan debt of national government with foreign marketable debt as proxy (DEBT) is used for the log of external debt (Moolman, et al, 2006).

The variables selected have varying expected relationship with RGDP. The relationship might be positive and negative or either positive or negative. For instance, in our variable analysis, FDI and INVE have a positive relationship with RGDP. EXCH and DEBT might have a positive or negative relationship with RGDP.

Foreign Direct Investment (FDI) and Domestic Investment (INVE) affect real GDP in the same way. An increase in FDI or INVE may result in an increase in RGDP. A decrease in FDI or INVE may lead to a fall in RGDP. FDI and INVE usually oppose each other. This is because policies meant to increase FDI would act to suppress or decrease INVE (Borensztein, et al, 1998, and Khaliq and Nov, 2007).
According to Fedderke and Romm (2004), real exchange rate (REXCH) appreciation leads to a decline in exports which simultaneously would have an effect on lowering RGDP. The opposite leads to depreciation of the exchange rate or devaluation. Exports will increase, resulting in an increase in real GDP. Real exchange rate signifies the exchange rate which is adjusted for inflation.

Foreign debt (DEBT) refers to the total loan debt of the national government. This is attributed to the foreign marketable debt. An increase in DEBT will cause a decrease in domestic investment (INVE), foreign direct investment (FDI) and economic growth (RGDP). This is because the funding meant to support FDI and INVE will be used in servicing the debt which would then deter RGDP in the long-run (Obwona, 2001).

Table 4.1 provides a summary of the variables used in the model, their description and the expected, a prior on the coefficients.

**Table 4.1 Variables Description and the Expected prior**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description of Variable</th>
<th>Expected, a prior</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRGDP</td>
<td>Log of real GDP</td>
<td>+ (positive)</td>
</tr>
<tr>
<td>LFDI</td>
<td>Log of FDI</td>
<td>+ (positive)</td>
</tr>
<tr>
<td>LINVE</td>
<td>Log of Credit to private sector</td>
<td>-/+ (negative/positive)</td>
</tr>
<tr>
<td>LREXCH</td>
<td>Log of Real effective exchange rate</td>
<td>-/+ (negative/positive)</td>
</tr>
<tr>
<td>LDEBT</td>
<td>Log of foreign debt</td>
<td>-/+ (negative/positive)</td>
</tr>
</tbody>
</table>

Source: Own table of expected prior: adapted from empirical literature

**4.4 Data Sources**

The study employs annual data in all its variables. This is in concordance with most FDI and growth studies reviewed in Chapter two. The data used for empirical estimations covers the period from 1980 to 2010 and is sourced from SARB, IMF and Statistics South Africa. The SARB is the main data source, for consistence purposes. It is presented as follows (KBP6640Y) gross value added at basic prices (RGDP), (KBP5550J) foreign direct investment (FDI), (KBP1360J) domestic investment (INVE), (KBP5378J) real exchange rate (REXCH) and (KBP4106F) total loan debt of national government (DEBT).
4.5 Estimation Techniques

4.5.1 Stationarity / Unit root tests
Granger and Newbold (1993) define a stationary time series as one with constant mean, constant variance and constant auto-variance for each given lag. A preliminary step in regression analysis using time series data is to perform unit root tests to check the characteristics and behaviour of the data. In this study, to examine the time series properties of the data, the Augmented Dickey Fuller (ADF) and the Phillips Perron (PP) tests will be employed.

The Augmented Dickey-Fuller removes all the structural effects (autocorrelation) in the time series and then tests using the same procedure as of the Dickey-Fuller Test. Phillips- Perron tests are similar to ADF tests, but they incorporate an automatic correction to the DF procedure to allow for autocorrelated residuals.

The tests often give the same conclusions, and suffer from most of the same important limitations as, the ADF tests.

4.5.2 Cointegration Test
According to Harris (1995:52), if two series appear to move together over time, it indicates an equilibrium relationship. For example, if two variables that are integrated of order one 1(1) and the residuals obtained from regressing $Y_t$ and $X_t$ are 1(0) then the two series are cointegrated (Harris, 1995:52).

After identifying such a cointegrating relationship, it is possible to analyse and interpret regressions involving non-stationary variables.

Two types of tests have emerged in the development of cointegration tests. These include the residual based tests and the maximum likelihood based on VAR system. The residual based tests include the Engle-Granger, and the three Step Engle and Yoo approach while the latter includes Johansen’s cointegration tests.

The two step Engle-Granger is a single equation based technique which suffers from a number of weaknesses. These include lack of power in unit root tests, simultaneous equation bias and the impossibility of performing hypothesis tests about the actual cointegrating relationships (Brooks, 2002:395). The Engle and Yoo approach attempts to improve on the Engle- Granger technique, but suffers from the same weaknesses, especially the inability to test the actual hypotheses concerning the cointegrating relationship (Brooks, 2002:395).
This study employs the Johansen (1988) and Johansen and Juselius (1990) method to test for long run equilibrium relationships in the real GDP equation. The advantage of this method is that it permits the identification of all cointegrating vectors within a given set of variables. Furthermore, the procedure has better asymptotic properties which yield more robust results.

The Johansen approach could be summarized in 5 steps as shown below.

(i) Test order of integration  
(ii) Specifying the VAR (k) order  
(iii) Test for cointegration  
(iv) Normalisation  
(v) Test of hypothesis/ Diagnostic test

In testing for the order of integration, unit root tests, as earlier explained in this chapter, will be used. The idea is to ascertain that the variables or series are integrated of order one I (1) so that the combination of these variables will produce residuals that will be integrated of order I (0) indicating existence of a cointegrating relationship.

The Johansen (1988) and the Johansen and Juselius (1990) procedure uses a maximum likelihood approach. The procedure is specified as follows with a vector autoregressive (VAR) model representation of order k:

$$Y_t = \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \Pi_k Y_{t-k} + \varepsilon_t$$ …………………………………….. ………. (4.3)

Where

$Y_t$ is n x 1 vector of I (1) endogenous variables in the VAR system

$\varepsilon_t$ is a vector of white noise error terms

The VAR model of equation (i) above is turned into a VECM of the following form:

$$\Delta Y_t = \mu + \Pi_k Y_{t-k} + \sum_{i=0}^{q} \Gamma_i \Delta Y_{t-i} + \mu_t$$ …………………………………….. (4.4)

Where $q = k - 1$, $\Delta Y_t$ are all I (0), $\Gamma$ are n x n coefficient matrices which represent the short run coefficients. $\Pi$ is the matrix whose rank $r$ determines the number of cointegrating vectors among the variables. The Johansen test is based on the examination of the $\Pi$ matrix. If $r = 0$ then there are no
cointegrating vectors. According to Harris (1995), if for instance Π has a reduced rank \( r \leq (n-1) \), this implies that it can be decomposed as follows:

\[
Π = αβ
\]

Where \( α \) is an \( n \times r \) matrix of error correction or speed of adjustment parameters and \( β \) is the long run vector.

In order to choose appropriate lag length for the VAR order, information criteria (IC) is used. The information criteria ensure that residuals are Gaussian. Various IC are available such as Akaike Information criterion (AIC), Schwarz criterion (SC), Hannan Quinn (HQ) and the Final Prediction Error (FPE). Where these provide conflicting results, the one which produces a white noise residual and the most economically interpretable results is chosen.

The Johansen procedure is designed to statistically determine the number of cointegrating vectors \( r \) in the VAR. In order to determine the number of cointegrating vectors or reduced rank, E-view provide a summary of the reduced rank for five deterministic trend assumptions.

Assumption 1 and 5 are not conventionally used in practice and for this reason focus is on assumptions 2, 3 and 4. In choosing the deterministic trend assumption, assumptions made on unit root tests are taken into account, for example intercept with no trend. Assumption 2 is chosen when none of the series appear to have a trend, Assumption 3 is chosen when the series is trending, but the trend is stochastic. Assumption 4 is chosen when some of the series are trend stationary which means stationary but non-stochastic (EViews 7 User Guide II, 2009: 687).

In cases where deterministic trend assumptions used in unit root tests do not agree, the approach in Seddighi et al, (2000: 272) is followed in choosing the deterministic trend assumption that produces results that are economically interpretable. To confirm that the cointegrating vectors estimated are truly stationary, a graph of the residuals is plotted. The graph plots residuals from the linear combination of variables. Visual inspection of the graph should show that the residuals are stationary thus confirming the cointegrating relation.
Having established the deterministic trend assumptions, the actual Johansen cointegration tests will be performed. Johansen (1988) provides two different likelihood ratio tests, the trace test and the maximum eigenvalue test statistics to determine the value of r.

Trace statistic is a joint test where the null is that the number of cointegrating vectors is less than or equal to r against an unspecified or general alternative that there are more than r.

The trace tests are shown as follows:

$$LR = T \sum \ln (1 - \lambda_i)$$  

(4.6)

In retrospect the maximum eigenvalue test statistics conducts separate tests on each eigenvalue, and has its null hypothesis that the number of cointegrating vectors is r against an alternative of r+1. The null hypothesis is tested sequentially from low to high values of r. The testing procedure ends when a null hypothesis fails to be rejected for the first time.

The maximum eigenvalue test statistics are shown as follows:

$$LR = T \ln (1 - \lambda_r + 1)$$  

(4.7)

Where $\lambda_i$ is the i-th largest Eigenvalue of the $\Pi_i$ matrix in equation (4.4)

A true cointegrating relationship is shown by a stationary graphical plot of the cointegrating vector. A graphical plot of the cointegrating vector should be stationary if there is a true cointegrating relationship.

Johansen (1992) proposes an ingenious likelihood-based test of weak exogeneity pertaining to the cointegrating vectors. Weak exogeneity test involves testing the significance of the feedback or loading coefficients in cointegrated VAR model, in an attempt to show feedback to deviations from the long run relationship. This is done in order to reveal information on the underlying economic structure (Engle et al, 1983:113). If all but one variable in a system are weakly exogenous, efficient inference about the cointegration parameters can be conducted in a single equation framework. The strategy for implementing weak exogeneity test involves first mapping the cointegrated VAR into a vector error correction model. This is followed by a reduction on the parameter space by imposing additional zero restrictions on the short run dynamics and finally testing the significance of the
feedback coefficients using a t- or F-test. The reason for this strategy is to increase the precision of the important test on $\alpha$ by reducing the number of estimated parameters first. Thus variables to be treated as endogenous and exogenous can be determined.

**4.5.3 Vector Error Correction Model (VECM)**

It is appropriate to estimate an error correction model if the relevant variables are cointegrated. According to Aziakpono (2006b:16), in a vector error-correction model, the short-term dynamics of the variables in the system are influenced by the deviation from equilibrium as shown in equation 4.8 below.

$$\Delta y_t = \beta_1 \Delta \chi_t + \beta_2 (y_{t-1} - \gamma x_{t-1}) + \mu_t .................................................. (4.8)$$

The error correction term is given by $y_{t-1} - \gamma x_{t-1}$. The implied coefficient on $x_{t-1}$ of one in this term suggests a proportional long run relationship between $y$ and $x$. The Error correction model specifies that: $y$ is supposed to change between $t-1$ and $t$ as a result of changes in the values of the explanatory variables $x$ between $t-1$ and $t$. The change in $y$ will also account for part correction to any disequilibrium at time $t$. $\gamma$ defines the long run relationship between $x$ and $y$. $\beta_1$ describes the short run relationship between changes in $x$ and changes in $y$. $\beta_2$ describes the speed of adjustment back to equilibrium. The implication is that it measures the proportion of the last period’s equilibrium error that is corrected.

The analysis of error correction is based on the examination of the coefficient of the error correction terms corresponding to the first variable in the cointegrating equation.

**4.6 Diagnostic Tests**

**4.6.1 Heteroscedasticity**

There are a number of formal heteroscedasticity tests as formulated by Brooks (2002). The study at hand used White (1980) general test for heteroscedasticity. The test is useful because it takes into account several assumptions. It assumes that the estimated regression model is linear. Regression produces residuals which are regressed to test the joint significance of the regression. Acceptance of the null hypothesis indicates homoscedasticity. Rejection of the null hypothesis indicates heteroscedasticity.
4.6.2 Residual Normality Test
The Jarque – Bera test will be used to test for normality. It uses the property of a normally distributed random variable. The entire distribution is characterised by the first two moments of the mean and the variance.

The test statistic asymptotically follows an $X^2$ under the null hypothesis that the distribution of the series is symmetric. The null hypothesis of normality would be rejected if the residuals from the model are either significantly skewed or leptokurtic (Gujarati, 2004:148).

4.6.3 Autocorrelation Langrage Multiplier (LM) Test
Langrage Multiplier (LM) test centres on the value of the $R^2$ for the auxiliary regression. If one or more coefficients in an equation are statistically significant, the value of $R^2$ for that equation will relatively significant. If none of the variables is significant, $R^2$ will be relatively low. The LM test operates by obtaining $R^2$ from the auxiliary regression and multiplying it by the number of observations, $T$. It can be shown as:

$$TR^2 \sim \chi^2(m)$$  \hspace{1cm} (4.9)

$m$ is the number of regressors in the auxiliary regression (excluding the constant term, equivalent to the number of restrictions that could have been placed under the F- tests approach).

4.7 Impulse Response Analysis
According to Brooks (2002: 341), impulse response analysis traces the responsiveness of the dependent variables in a VAR to shocks from each of the variable. Brooks (2002: 341) further reiterates that a unit shock is applied to the error term for each variable in each equation separately and the effects on the VAR system are observed over time.

The shocks are expected to die gradually if the system is stable. In circumstances where the series are non-stationary, impulse responses will be computed from the VECM, due to the fact that the forecast error variance estimates will be consistent and the predictions asymptotically optimal thereof (Aziakpono, 2006a:26).

The generalised impulse response analysis for unrestricted vector autoregressive (VAR) and cointegrated VAR as proposed by authors Koop, Pesaran, and Potter (1996) will be used in the study. The approach does not require orthogonalisation of shocks and is invariant to the ordering of
the variables in the VAR. Furthermore, the approach fully takes into account historical patterns of correlations amongst the different shocks (Lutkepohl, 1993:50).

4.8 Variance Decomposition Analysis

According to Brooks (2002:342), variance decomposition analysis shows the proportion of movements in the dependent variables that are due to its own shocks, against shocks to other variables. Thus variance decomposition analysis determines how much of the \( s \)-step forecast error variance of a given variable is explained by innovations to each explanatory variable. This is congruent with empirical literature which often entail that own series shocks explain most of the error variances of the series in a VAR (Lutkepol, 1993:59).

The ordering of variables is important in the variance decomposition analysis, and as cited in Lutkepohl (1993:59) by Sims (1981), the problem of ordering variables can be solved by trying different orderings and analysing the sensitivity of results when ordering is changed. However, ordering is of less importance when residuals are not contemporaneously correlated.

4.9 Concluding Remarks

This chapter discussed the methodology, variable analysis and the estimation techniques in the quest of investigating the effects of FDI on economic growth in South African perspective. The Johansen Cointegration and VECM frameworks were presented as the estimation methods employed in the study. This was followed by a discussion of the diagnostic tests. The chapter ends with a discussion of impulse response and variance decomposition analysis. The contents of this chapter provide a basis for the actual estimations to the study, as portrayed in the preceding chapter five.
CHAPTER 5

ESTIMATIONS AND ANALYSIS OF RESULTS

5.1 Introduction
This chapter provides an overview of the estimated results and relevant findings by providing an analysis of the empirical findings. The chapter comprises of seven sections. The first section presents the results of the stationarity/unit root tests. The second section discusses the cointegration test results. The third section reports on the long and short run terms of the Vector Error Correction Model. Diagnostic tests results are presented in the fourth section. Impulse response and variance decomposition analysis are discussed in the fifth and sixth section respectively. The last section concludes the chapter.

5.2 Unit Root Tests
The cointegration test among the variables that are used in the model requires the existence of a unit root for each variable. A preliminary test for unit root is first carried out using the graphical method. The rationale is to check the properties of time series data. Graphical plots in Figure 5.1(a) suggest that the variables LRGDP, LFDI, LINVE and LDEBT seem to be trending upwards while LREXCH does not show a clear trend as it fluctuates over time. All of the series seem to be exhibiting a time varying mean and variance suggesting that they are non-stationary in levels.

Figure 5.1 (b) shows that all differenced variables fluctuate around the zero mean hence the variables are likely to be integrated of order one 1(1). This implies that the data is stationary if integrated of order one. The rationale is to avoid a spurious regression. However, one cannot precisely base conclusions on the graphical analysis because it is an informal test for stationarity. This entails the performance of formal unit root tests, in order to reinforce the findings from the graphical analysis. The Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests were conducted to reinforce the graphical analysis findings. The results of the ADF and PP tests are presented in Table 5.1 and are reported from Appendix 5(a).
Figure 5.1(a) Plots of Variables at Level (1980-2010)
Figure 5.1(b) Plots of First Differenced Variables (1980-2010)
Table 5.1 Unit Root Tests Results

<table>
<thead>
<tr>
<th></th>
<th>ADF</th>
<th></th>
<th>PP</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>1st Diff</td>
<td>Level</td>
<td>1st Diff</td>
</tr>
<tr>
<td>LRGDP</td>
<td>-1.167</td>
<td>-3.822</td>
<td>-0.535</td>
<td>-4.465</td>
</tr>
<tr>
<td>LFDI</td>
<td>0.258</td>
<td>-3.661</td>
<td>0.151</td>
<td>-6.416</td>
</tr>
<tr>
<td>LINVE</td>
<td>-0.033</td>
<td>-6.135</td>
<td>-0.143</td>
<td>-9.424</td>
</tr>
<tr>
<td>LREXCH</td>
<td>-3.019</td>
<td>-4.158</td>
<td>-2.535</td>
<td>-4.836</td>
</tr>
<tr>
<td>LDEBT</td>
<td>-2.047</td>
<td>-3.735</td>
<td>-1.890</td>
<td>-4.581</td>
</tr>
</tbody>
</table>

Critical for ADF and PP is -3.574 at 5%

Source: Own table with data from E views 7 iterations

The results reported above were carried with both intercept and trend. Other deterministic trend assumptions were explored but did not yield better results. Under the assumptions of no intercept and trend in all cases and trend no intercept in some of the cases, the test statistics were insignificant, hence only the ones that produced better results were reported. Appendix 5(a) shows the results of the ADF and PP tests at various levels of significance. The unit root tests using intercept and trend suggests that all series are non-stationary in level and becomes stationary after differencing. Thus the variables becomes integrated of order one, 1(1).

5.3 Cointegration Analysis

The cointegration approach allows an integration of the long run and short run relationship between variables within a unified framework. The most important step is to ensure that all variables are integrated of the same order. This can be achieved through differencing all the variables once. This study employs the Johansen’s (Johansen and Juselius 1990) maximum likelihood approach to test for cointegration.

Testing for cointegration can be a daunting task for researchers. This is in instances where a model with many variables is used. A model of such calibre produces too many cointegrating equations which are difficult to interpret. The best option when faced with such a scenario is to estimate a simplified model (parsimonious) with few variables but with risk of an omitted variable bias (misspecification) (Takaendesa, 2006: 109). One other way is to apply the pair-wise correlation matrix to guide the variable selection exercise.
The pair-wise correlation matrix is adopted in this study to determine the exact relationship between the five variables used in the study. Results from the pair-wise correlation matrix are presented in Table 5.2 below.

**Table 5.2: Pair-wise Correlation Results**

<table>
<thead>
<tr>
<th>Variable</th>
<th>RGDP</th>
<th>FDI</th>
<th>INVE</th>
<th>REXCH</th>
<th>DEBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGDP</td>
<td>1.000</td>
<td>0.767</td>
<td>0.642</td>
<td>-0.323</td>
<td>-0.272</td>
</tr>
<tr>
<td>FDI</td>
<td>0.767</td>
<td>1.000</td>
<td>0.243</td>
<td>-0.425</td>
<td>-0.762</td>
</tr>
<tr>
<td>INVE</td>
<td>0.642</td>
<td>0.241</td>
<td>1.000</td>
<td>-0.262</td>
<td>0.1861</td>
</tr>
<tr>
<td>REXCH</td>
<td>-0.323</td>
<td>-0.425</td>
<td>-0.262</td>
<td>1.000</td>
<td>0.824</td>
</tr>
<tr>
<td>DEBT</td>
<td>-0.272</td>
<td>-0.762</td>
<td>0.1861</td>
<td>0.824</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Source: Own table with data from E views 7 iterations.

From the pair-wise correlation results shown above, FDI and INVE are positively correlated with the dependent variable RGDP. FDI is highly correlated with RGDP than INVE. The positive correlation of both variables is in line with previously stated theoretical underpinnings. Theory suggests that an increase in foreign direct investment and domestic investment causes an increase in economic growth. This emanates from increased consumption expenditure, employment and capital outlay amongst several other positive effects (Obwona, 2001 and Moolman, et al, 2006).

REXCH and DEBT are negatively correlated with RGDP. This confirms theoretical suggestions, which propose that the depreciation in the exchange rate discourages investment. This translates into low levels of economic growth. On the same note, an increase in DEBT has a negative long run relationship with RGDP. The logic lies in the interest accrued in debt repayment. This suppresses the coffers that could have been channelled for further development (Moolman, et al, 2006).

In support to the remark that all variables are correlated with RGDP and there is no one specific variable which is correlated to all the variables, this implies that there is less likelihood of multicollinearity problem. In this regard, RGDP is specified with the proposed explanatory variables.

In using the Johansen test, there is need to determine optimal lag length which eliminates serial correlation in the residuals as well as determining the deterministic trend assumptions for the VAR model. To select the lag order for the VAR, the information criteria approach is applied as a
direction in choosing lag order. In this study, the selection is made using a maximum of 3 lags in order to permit adjustment in the model and accomplish well behaved residuals. Table 5.3 confirms the lag lengths selected by different information criteria.

**Table 5.3 Lag Order Selection Criteria**

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>66.87453</td>
<td>NA</td>
<td>1.32e-07</td>
<td>-4.491038</td>
<td>-4.300723</td>
<td>-4.432857</td>
</tr>
<tr>
<td>1</td>
<td>145.0930</td>
<td>128.5018*</td>
<td>1.57e-09*</td>
<td>-8.935215*</td>
<td>-7.983640*</td>
<td>-8.644309*</td>
</tr>
<tr>
<td>2</td>
<td>159.9438</td>
<td>20.15467</td>
<td>1.85e-09</td>
<td>-8.853130</td>
<td>-7.140296</td>
<td>-8.329499</td>
</tr>
<tr>
<td>3</td>
<td>174.8381</td>
<td>15.95820</td>
<td>2.47e-09</td>
<td>-8.774153</td>
<td>-6.300059</td>
<td>-8.017798</td>
</tr>
</tbody>
</table>

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

Table 5.3 above shows that all the criteria selected 1 lag. Therefore, the information criteria approach produced agreeing results and a decision to adopt 1 lag can be made. Subsequently, the Johansen cointegration test is conducted using 1 lag for the VAR.

The Johansen cointegration based on the trace test is shown in Table 5.4 (a). The trace test the null hypothesis that the number of cointegrating equations is greater than the number of variables involved. The null hypothesis fails to be rejected if the test statistic is smaller than the critical values of the trace tests. Table 5.4(b) presents the results of the Johansen cointegration tests based on the maximum eigenvalue. The maximum eigenvalue test is conducted on the null hypothesis of the number of cointegrating equations (r) against the alternative hypothesis of number of cointegrating equations plus one (r + 1). The null hypothesis cannot be rejected if the test statistic is smaller than the maximum eigenvalue test critical value.
Table 5.4 (a) Cointegration Rank Test (Trace)

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Trace Eigenvalue</th>
<th>Trace Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.710715</td>
<td>84.23957</td>
<td>69.81889</td>
<td>0.0023</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.531279</td>
<td>48.26959</td>
<td>47.85613</td>
<td>0.0457</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.403314</td>
<td>26.29489</td>
<td>29.79707</td>
<td>0.1201</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.303432</td>
<td>11.32032</td>
<td>15.49471</td>
<td>0.1925</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.028357</td>
<td>0.834232</td>
<td>3.841466</td>
<td>0.3611</td>
</tr>
</tbody>
</table>

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Table 5.4 (b) Cointegration Rank Test (Maximum Eigenvalue)

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Max-Eigen Eigenvalue</th>
<th>Max-Eigen Statistic</th>
<th>0.05 Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0.710715</td>
<td>35.96998</td>
<td>33.87687</td>
<td>0.0277</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.531279</td>
<td>21.97470</td>
<td>27.58434</td>
<td>0.2217</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.403314</td>
<td>14.97457</td>
<td>21.13162</td>
<td>0.2907</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.303432</td>
<td>10.48609</td>
<td>14.26460</td>
<td>0.1819</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.028357</td>
<td>0.834232</td>
<td>3.841466</td>
<td>0.3611</td>
</tr>
</tbody>
</table>

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

* denotes rejection of the hypothesis at the 0.05 level

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

The trace test which is much stricter reflected that at least two cointegrating equations exist at 5 per cent significance level. The null hypothesis of no cointegrating vectors and at most 1 is rejected since the trace (test) statistic of 84.24 and 48.27 is greater than the 5 per cent critical value of approximately 69.82 and 47.86 respectively. Hence the trace statistics specified 2 cointegrating relationship at 5 per cent significance level.

The maximum eigenvalue test in Table 5.4 (b) reveals that at least one cointegrating equation exists at 5 per cent significance level. The null hypothesis of no cointegrating vectors is rejected since the eigenvalue of 35.97 is greater than the 5 per cent critical value of about 33.88. Using the same
analysis, the null hypothesis that there is at most one cointegrating vector cannot be rejected since the test statistic of 21.98 is less than the 5 per cent critical value of 27.58. Therefore it can be concluded that there are two significant long run relationships between the variables using the trace test. Since variables can either have short or long run effects, a vector error correction model (VECM) was used to disaggregate these effects.

A summary of results in Table 5.4 (a) shows the existence of two cointegrating equations. Trace test and the maximum eigenvalue test evidently generate conflicting results. In such a situation Johansen and Juselius (1990) advises the examination of the cointegrating vector and base the decision on the interpretability of the cointegrating relations.

Luintel and Khan (1999:32) reiterated that, it is essential to use results of both tests. In this regard, the choice of the cointegration rank should be guided by prior theoretical information.

Batchelor (2000:12) in turn suggests that, in the presence of two cointegrating equations, there is need for normalization of the cointegrating coefficients. The normalization process yields one cointegration equation and one cointegration vector. Bartchelor’s approach is adopted in the study.

The cointegration vector represents the deviations of the endogenous variable from its long run equilibrium level. Figure 5.2 suggests that from 1980 to 2010 the deviations of RGDP from equilibrium were stationary. This is critical for its use as an error correction model.

**Figure 5.2 Cointegrating Vector**

[Graph showing cointegrating vector from 1984 to 2010]

Source: Eviews 7 Computation: Data from SARB, 2011
5.4 Vector Error Correction Model

The discovery of at least one cointegration equation in the previous section implies that a VECM can be used. This allows us to distinguish between the short and long run effects of variables so as to establish the effect of foreign direct investment on economic growth.

Assumption three of using intercept and no trend was used in the model. Other deterministic assumptions were explored but did not yield interpretable results. Section 5.4.1 and 5.4.2 presents results of the VECM over the Long run and Short run period. The results are reported from Appendix 5(b). A summary of the Long run and Short run parameters is presented in Table 5.5 and Table 5.6 respectively.

5.4.1 Long Run Terms
Summary of the long run parameters in the model is reported in Table 5.5 below (see Appendix 5(b)).

Table 5.5 Results of Long Run Cointegration Equation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.660</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RGDP</td>
<td>1.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FDI</td>
<td>-0.539</td>
<td>0.113</td>
<td>-4.776</td>
</tr>
<tr>
<td>INVE</td>
<td>0.782</td>
<td>0.181</td>
<td>4.325</td>
</tr>
<tr>
<td>REXCH</td>
<td>-2.799</td>
<td>0.424</td>
<td>-6.604</td>
</tr>
<tr>
<td>DEBT</td>
<td>-0.544</td>
<td>0.091</td>
<td>-5.959</td>
</tr>
</tbody>
</table>

Source: Own table with data from Eviews 7: VECM assumption 3

The long run impact of the explanatory variables on RGDP as shown by table 5.5 is illustrated using equation 5.1:

\[
\text{RGDP} = 4.660 - 0.539\text{FDI} + 0.782\text{INVE} - 2.799\text{REXCH} -0.544\text{DEBT} \ldots \ldots \ldots (5.1)
\]

Equation 5.1 shows that FDI, REXCH and DEBT have a negative long run relationship with RGDP. INVE has a positive impact on RGDP. All the explanatory variables are statistically significant in explaining RGDP since they have absolute t-values greater than 2.
A unit increase in FDI causes a decrease in RGDP by 53.9 per cent. This is not compatible with theory. In theoretical suggestions, FDI causes an increase in economic growth. This emanates from the spill-over effects in capital, technology and an increase in production. Reasons for this phenomenon could have been attributed to the recent emergence of the global financial crisis. The global financial crisis originated in the US in 2010. Firsher (1936: 158) defines the financial crisis as a disruption to world trade due to the inefficient allocation of capital resources. As a result, there is impediment in the flow of investment. The implications of the financial crisis are still crippling major foreign investment economies.

A unit increase in domestic investment results in an increase in RGDP by 78.2 per cent. The relationship is consistent with theory. Domestic investment has been curtailed by the ease of credit availability from the financial sector. This emanates from the fact that a more developed financial sector would entail transparency in the financial system. This has implications of increased domestic investment. Hence a positive relationship with RGDP is ensued (Khaliq and Noy, 2007).

Real effective exchange rate has a negative long run relationship with RGDP in the model. The t-value, -6.60 is significant at 5 per cent level. The result is plausible since an appreciation in the exchange rate, may result in increase in RGDP. The rationale is that strong currency translates local currency profits into large foreign currency profits. A unit increase in real exchange rate will result in 2.7 per cent decrease in RGDP.

Debt which is a measure of total loan debt of national government is found to be significant and negatively related to RGDP. This is portrayed by a t value of -5.96 at 5 per cent level of significance. A unit increase in debt reduces RGDP by 54.4 per cent. This is compatible with economic theory. In theoretical suggestions, developing countries have somewhat relied on debt to aid their economic activities. This has a negative implication on economic growth in the long run as finances meant for economic development are channelled towards repayment of interest accrued debt.

5.4.2 Speed of Adjustment and Short Run Terms

The speed of adjustment is indicated by the coefficients of the error correction terms. Results from the error correction model are presented in Table 5.6 (see Appendix 5b).
Using results from table 5.6, the coefficient of D (RGDP) is reported as -0.285. This shows that the speed of adjustment is approximately 28.5 per cent. The implication is that, if there is a deviation from equilibrium, only 28.5 per cent is corrected in one year as the variable moves towards restoring equilibrium. Thus, there is no strong pressure on RGDP to restore long run equilibrium whenever there is a disturbance. The speed of adjustment is statistically significant with a negative t-value of -1.168.

The low speed of adjustment by RGDP may reflect the existence of some factors affecting RGDP in South Africa other than FDI. These factors include level of education connoted as human capital, consumer price index, imports and exports, amongst others.

The lag of LFDI is found to have a positive effect on RGDP in the short-run. However the t-value of -1.765 is insignificant. The coefficient shows that current RGDP can increase by 86.3 per cent if LFDI is increased by 1 per cent. This shows that the exogenous component of FDI exerts a reliable, positive impact on economic growth.

The error term, which has been included to take into account all factors that affects RGDP but were not taken into account explicitly, was found to be insignificant. Despite its insignificance, the usage of the error term made rightful contribution in determination of the cointegrating relationship in the model. Thus, a model with an error term is preferred to a model without an error term.

### 5.5 Diagnostic Tests

Diagnostic tests are crucially important to the economic growth model (RGDP) because they validate the parameter evaluation of the outcomes achieved by the model. This arises because if there is a problem in the residuals from the estimated model, it means the model is not efficient and the estimated parameters will be biased. The fitness of the model was tested in three main ways.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGDP</td>
<td>-0.285</td>
<td>0.146</td>
<td>-1.168</td>
</tr>
<tr>
<td>FDI</td>
<td>0.863</td>
<td>0.643</td>
<td>-1.765</td>
</tr>
<tr>
<td>INVE</td>
<td>-0.756</td>
<td>0.701</td>
<td>-1.078</td>
</tr>
<tr>
<td>REXCH</td>
<td>0.449</td>
<td>0.204</td>
<td>2.195</td>
</tr>
<tr>
<td>DEBT</td>
<td>-0.667</td>
<td>0.402</td>
<td>-1.658</td>
</tr>
</tbody>
</table>

Source: VECM results using data sourced from SARB, 2011
Firstly heteroscedasticity was tested using White’s test with no cross terms. This was followed by Jarque-Bera’s normality test. Finally serial correlation was tested using the Langrage multiplier (LM) test. The Diagnostic test results are shown in Table 5.7.

**Table 5.7 Diagnostic Test Results**

<table>
<thead>
<tr>
<th>Test</th>
<th>Null Hypothesis</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>White (Chi-sq.)</td>
<td>No conditional heteroscedasticity</td>
<td>319.086</td>
<td>0.215</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>There is normal distribution</td>
<td>13.779</td>
<td>0.183</td>
</tr>
<tr>
<td>Langrage Multiplier (LM)</td>
<td>No Serial Correlation</td>
<td>30.623</td>
<td>0.702</td>
</tr>
</tbody>
</table>

Source: Diagnostic test results using data sourced from SARB, 2011

**5.5.1 Heteroscedasticity**

Results from Table 5.7 shows that the test for heteroscedasticity using White test with no cross-terms produced a Ch-sq of 319.086 at a probability of 0.215. The presence of heteroscedasticity means the model has some misspecifications hence conclusive results cannot be derived from such a model. The null hypothesis of no heteroscedasticity or no misspecification will thus not be rejected. This implies that the model has no misspecifications and can be relied on.

**5.5.2 Residual Normality Test**

Normality tests were carried using the Jarque –Bera (J-B) test. The J-B statistic follows the chi-square distribution with 2d.f. If the computed p value of the J-B is sufficiently low, which will happen if the value of the test statistic is different from 0, one can reject the hypothesis that the residuals are normally distributed. If the p value is high, that is when the value of the test statistic is close to 0; we do not reject the normality assumption (Gujarati, 2004:148).

Based on results from Table 5.7, the Jarque- Bera statistic of 13.779 with a probability of 0.183 indicates the rejection of the null hypothesis at 5 per cent significance level. This shows that residuals are not normally distributed. According to Harris (1995:83), non-normality in the residuals is not a problem. The argument stems from the fact that some variables are weakly exogenous. In the model weakly exogenous variables include FDI, REXCH and DEBT.
5.5.3 Autocorrelation Langrage Multiplier (LM) Test
The problem of serial correlation arises when a variable has relationships with itself in a manner that the value of such a variable in past periods has an effect on its future values (Gujarati, 2004:680).

The results reported in Table 5.7 show that the test for serial correlation produced an LM statistic of 30.623 with a probability of 0.702. This suggests that we cannot reject the null hypothesis of no serial correlation due to high probability.

The diagnostic checks have all revealed the suitability of the model. Thus, compelling conclusions on the effect of foreign direct investment on economic growth can be deduced and applicable policies can be safely formulated.

5.6 Impulse Response Analysis

The study focuses on the effect of foreign direct investment on economic growth. Only responses of RGDP to FDI and its dependent variables are reported in Figure 5.4 on page 74. These impulse response functions show the dynamic response of RGDP to a one-period standard deviation shock to the innovations of the system and also indicate the directions and persistence of the response to each of the shocks over a 10 year period. The impulse response functions have the expected pattern and confirm the results from the short-run relationship analysis. Shocks to all the variables are significant but not persistent. The results of the variance decomposition analysis are presented in Table 5.8 on page 76.
Figure 5.3 Impulse Response Results

Response to Cholesky One S.D Innovations

- Response of LOG_RGDP to LOG_RGDP
- Response of LOG_RGDP to LOG_FDI
- Response of LOG_RGDP to LOG_INVE
- Response of LOG_RGDP to LOG_REXCH
- Response of LOG_RGDP to LOG_DEBT
In the results of the model above, one period standard deviation shock on RGDP produces a large positive impact on itself by nearly 4 per cent. This is persistent from the first to the fifth year. The shocks die off becoming negative from the sixth to the tenth year.

Innovations on FDI shows a positive impact which rises gradually during the first three years and continues to be persistent in the sixth year to the tenth year. The signs are consistent with signs on short run parameters.

A one-period shock to INVE has a lasting positive impact on RGDP. The shock appreciates RGDP by nearly 2 per cent and dies off in the sixth year onwards.

Shocks on REXCH, and DEBT generates a negative response on RGDP. The shocks are not significantly different from zero and are transitory. The signs are consistent with findings on long run parameters. Either sign could apply on REXCH and RGDP relationship since there is no consensus on the correct sign. This usually depends on which sign has a larger impact at a particular point in time. It takes a period of six years for REXCH to adjust towards equilibrium. A shock on DEBT has a marginal depreciation effect on RGDP. The shock fluctuates below 1 per cent. The adjustment towards the equilibrium is visible midway through the sixth year.

5.7 Variance Decomposition Analysis

Variance decomposition analysis indicates the proportion of the movements in a sequence due to its own shocks versus shocks to other variables. It shows the fraction of the forecast error variance for each variable that is attributable to its innovations and innovations in the other variables in the system. The results of the variance decomposition analysis are presented in Table 5.8 and these show the proportion of the forecast error variance in RGDP explained by its own innovations and innovations in explanatory variables.
Table 5.8 Variance Decomposition of RGDP

<table>
<thead>
<tr>
<th>Period</th>
<th>S.E.</th>
<th>RGDP</th>
<th>FDI</th>
<th>INVE</th>
<th>REXCH</th>
<th>DEBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.02435</td>
<td>100.0000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>2</td>
<td>0.04462</td>
<td>85.75977</td>
<td>11.33033</td>
<td>0.562735</td>
<td>0.004200</td>
<td>2.342966</td>
</tr>
<tr>
<td>3</td>
<td>0.05283</td>
<td>83.55162</td>
<td>8.606726</td>
<td>1.673914</td>
<td>1.467766</td>
<td>4.699976</td>
</tr>
<tr>
<td>4</td>
<td>0.05698</td>
<td>81.91474</td>
<td>6.442034</td>
<td>1.808133</td>
<td>4.346770</td>
<td>5.488325</td>
</tr>
<tr>
<td>5</td>
<td>0.06941</td>
<td>76.80461</td>
<td>5.816499</td>
<td>1.492371</td>
<td>7.857144</td>
<td>8.029375</td>
</tr>
<tr>
<td>6</td>
<td>0.10872</td>
<td>69.95331</td>
<td>6.339770</td>
<td>1.457896</td>
<td>11.25300</td>
<td>10.99603</td>
</tr>
<tr>
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<td>0.12594</td>
<td>65.07803</td>
<td>8.524421</td>
<td>1.327301</td>
<td>13.69006</td>
<td>11.38019</td>
</tr>
<tr>
<td>8</td>
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<td>61.27560</td>
<td>10.92748</td>
<td>1.170047</td>
<td>15.65180</td>
<td>10.97507</td>
</tr>
<tr>
<td>9</td>
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<td>12.62958</td>
<td>1.076705</td>
<td>16.99922</td>
<td>10.50600</td>
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<tr>
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<td>14.01024</td>
<td>1.011529</td>
<td>17.53535</td>
<td>10.07037</td>
</tr>
</tbody>
</table>

Source: Variance decomposition results using data from SARB, 2011

The variance decomposition analysis above covers a period of 10 years in order to ascertain the effects when the variables were allowed to affect RGDP for a relatively longer time.

In the first year, all of the variance in RGDP is explained by its own innovations or shocks, This is as suggested by Brooks (2002:342).

For the 5th year ahead forecast error variance, RGDP explains about 77 per cent of its variation. This is consistent with impulse response results. Explanatory variables account for 23 per cent of the error variance. FDI explains 6 per cent, INVE about 1 per cent, REXCH about 8 per cent and DEBT 8 per cent.

After a period of 10 years, RGDP explains about 57 per cent of its own variation. Explanatory variables explain the remaining 43 per cent. The influence of FDI increases substantially to about 14 per cent. INVE remain at 1 per cent. REXCH increases to about 18 per cent. This explains the largest component of the 43 per cent variation in RGDP that is explained by the explanatory variables. DEBT increases slightly to 10 per cent.

The variance decomposition analysis results are compatible with economic theory. Shocks to the explanatory variables continued to explain a significant proportion of the variation in RGDP. This is consistent with results from the impulse response analysis.
5.8 Concluding Remarks

The chapter analysed the effect of foreign direct on economic growth in South Africa. The chapter was divided into seven sections including the introduction. The second section presented the graphical analysis and unit root tests. Graphical analysis and the unit root tests showed that all the series were non stationary in level but became stationary after first difference. Therefore the series were integrated of the same order 1(1).

Cointegration tests were presented in the third section. The Johansen’s maximum likelihood approach was used. The pair- wise correlation matrix was adopted in the study to determine the exact relationship between the five variables used in the study. Results from the pair- wise correlation matrix reported that all variables are correlated with RGDP and there is no one specific variable which is correlated to all the variables, confirming a less likelihood of multicollinearity problem. Thus RGDP was specified with the proposed explanatory variables.

The lag order information criteria approach was applied as a direction in choosing the lag order. A decision to adopt 1 lag for VAR was made. This decision was made after all the information criteria approaches used selected 1 lag.

The trace and maximum eigenvalue tests were used to test for cointegration. The trace test reflected the existence of two cointegrating equations. The maximum eigenvalue reviewed the presence of at least one cointegrating vector. Thus it was concluded that there was one significant long run relationship and one cointegrating vector after normalisation.

Variables can either have short or long run effects. A vector error correction model (VECM) was presented in the fourth section to disaggregate these effects. The explanatory variables were either significant or insignificant depending on the time period.

Diagnostic tests presented in section five indicated that the residuals were well behaved. The impulse response and variance decomposition analysis were discussed in section seven and eight respectively. Most of the impulse response analysis results had the correct signs and confirmed cointegration findings. Most shocks were not persistent. Variance decomposition results showed that RGDP itself explain most of the forecast error variance. LFDI explained very little proportions of variation in RGDP.
The reliability of these results entails that compelling conclusions on the effect of foreign direct investment on economic growth can be deduced and applicable policies can be formulated.
CHAPTER 6

CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter offers conclusions and policy recommendations to the study. The first section provides a brief summary of each chapter of the dissertation. The second section offers a discussion on policy implications and recommendations to the findings. Limitations of the study and areas for further research are presented in the last section.

6.2 Summary of the Main Findings

The aim of this study was to explore the effect of foreign direct investment on economic growth. In doing so Chapter two provided the theoretical foundation and empirical evidence of the study. In this endeavour two classes of theories were discussed. Theories discussed include theories on economic growth and theories on FDI. Harrod Domar’s growth theory, Neo-classical growth theory and the New Endogenous growth theory were reviewed on growth theories. Eclectic theory and Industrial organisation theory were explored under FDI theories. Theories on economic growth provided a basis for understanding the role of savings and investment in the industrial development of economies. Theories on FDI identified a number of factors important in attracting FDI by host countries and firms. This is prevalent in understanding the specific ownership, internalization and locational advantages necessary for foreign investment.

Empirical literature has been consistent with the theories reviewed. Aspects such as technological progress, human capital, savings and investment were found to be significant factors in economic development of nations.

Studies that were reviewed on the effect of foreign direct investment on economic growth were found to be positive and significant especially for individual countries than for transnational countries.

Chapter three gave an overview of South Africa’s FDI inflows and economic growth. The chapter was divided into six sections. The first section gave a general background on FDI in
South Africa. The following section provided historical trends in FDI on international, regional and local perspective. The third section discussed the determinants of FDI in South Africa. Following was an overview of economic growth in South Africa. Factors affecting economic growth apart from FDIs were discussed in section five. The sixth section concluded the chapter.

Global FDI inflows have been fluctuating between developing and developed countries. This was attributed to increased cross-border mergers, acquisitions and participation of companies. Africa’s share of global FDI has remained retarded. A large share of Africa’s investment has been concentrated in Angola, Equatorial Guinea, Egypt, Sudan and Nigeria. The key investors have been the OECD countries. The extractive industry has been the prominent sector.

FDI inflows in South Africa have increased over time relative to the size of other similar emerging markets. The inflow however, is still below the expected levels. This is regardless of the exceptional years of 1997, 2001, 2005 and 2010. From the FDI inflows, the mining sector has been the major recipient followed by service and manufacturing sectors. The major sources of FDI have been Europe followed by USA and Asia.

South African economic growth showed positive results from 1990 to 2010. The only exception was in 2009. This has been indicted by reduced investor sentiment following the insurgence of the financial crisis.

Other explanatory variables on South Africa’s economic growth suggested a spiralling upward trend. This had positive implications for domestic investment which would entail growth. The opposite was true for the rising debt levels and depreciating currency.

Chapter four presented the model specification and how the model was estimated. The variables used were real gross domestic product, domestic investment, real exchange rate and debt. The model employed the Augmented Dickey Fuller and Phillips Perron tests for unit root. The Johansen (1991, 1995) cointegration technique was also employed. Diagnostic checks were done including the residual normality test, heteroscedasticity and autocorrelation Langrage Multiplier. The impulse response and variance decomposition tests were also done to check the responsiveness and importance of shocks to the variable of interest.
Chapter five analysed the effect of foreign direct investment and other explanatory variables on economic growth. The chapter analysed the time series properties of the data employing the formal and informal tests. The data was subjected to stationarity tests using the Augmented Dickey Fuller and the Phillips Perron tests. Variables were non-stationary in levels. After being differenced once, all variables become stationary, implying that all variables entered the model in first difference. After testing for stationarity it was necessary to find out whether there is any long term relationship between economic growth and foreign direct investment, which is cointegration. The Johansen-Juselius technique was employed. The results suggested the presence of two cointegrating vectors, of which a decision was taken to adopt one cointegrating vector. With one cointegration relationship, an error correction model was estimated for RGDP. The model was subjected to a number of statistical and diagnostic tests. All the tests suggest a robust model. The short –run dynamics were consistent with literature. Short run results indicated that there is no strong pressure on RGDP to restore long-run equilibrium whenever there is a disturbance. The short run lag of FDI was found to exert a positive impact on growth.

The long run results showed that FDI, REXCH and DEBT have a negative relationship with RGDP. INVE has a positive impact on RGDP. All explanatory variables were statistically significant in explaining RGDP since they have absolute t-values greater than 2.

Impulse response results were found to be consistent with short-run dynamics. Shocks on RGDP, FDI and INVE had a lasting positive impact on RGDP. Shocks on REXCH, and DEBT generated a negative response on RGDP. The shocks were not significantly different from zero and were transitory.

The results of the variance decomposition analysis confirmed the long run results. For the 5th year forecast error variance, RGDP explained about 77 per cent of its variation. Explanatory variables accounted for 23 per cent of the error variance. Of the explanatory variables, FDI exerted, 6 per cent, INVE, 1 per cent, REXCH, 8 per cent and DEBT 8 per cent. After a period of 10 years, RGDP explained about 57 per cent of its own variation. Explanatory variables explained the remaining 43 per cent. The influence of FDI increased substantially to about 14 per cent. INVE remained at 1 per cent, REXCH increased to about 18 per cent. DEBT increased slightly to 10 per cent.
6.3 Policy Implications and Recommendations

The findings imply that foreign direct investment does not exert reliable impact on economic growth. This was after taking consideration of the long-run results. In the short-run, foreign direct investment causes a positive impact on economic growth whilst crowding-out domestic investment.

The results from the findings imply that the policies and incentives implemented by the government could have had little impact of attracting foreign direct investment that could enhance a significant impact economic growth in the long-run. This would however verily support Harrod Domar growth model which suggests that, FDI enables host countries to achieve investment that exceeds their own domestic saving and enhances capital formation. According to this theory, the potential beneficial impact of FDI on output growth is confined to the short-run. In the long run, given the diminishing marginal returns to physical capital, the recipient economy could converge to the steady state growth rate as if FDI has never taken place leaving no permanent impact on the growth of the economy (De mello, 1997).

On the other hand, the New Endogenous growth model which is modern highlight the importance of improvement in technology, efficiency and productivity in suggesting that FDI can positively influence the growth rate in so far as it generates increasing returns in production via externalities and production spill-overs. This is supported by the fact that, with an increase in the pace of globalization that resulted partly from liberalization of trade and exchange rate regimes, the volume of FDI has increased throughout the world. South Africa is not spurred in this phenomenon. However, the results of the long-run parameters confirmed the opposite in entailing that FDI has a negative impact on economic growth. The reason could be attributed to a shift in FDI from the traditional manufacturing sector towards the more efficient green-field investments and service sector. Results from the sectoral analysis reviewed in chapter three highlight such changes.

Sectoral analysis indicated that the financial sector is now the major recipient of FDI to South Africa. This suggests the possibility of a shift in FDI motives from natural resource seeking and market seeking FDI to efficiency seeking FDI. This is confirmed by increased role of the services sector in FDI. Evidence in support of this supposition is shown by the increase in
mergers and acquisitions as opposed to green-field investment. FDI policy for the financial and services sectors need to be targeted to efficiency seeking FDI. FDI should also be encouraged in other sectors of the economy in order to diversify and increase total inflows.

South Africa needs to maintain strong bi-lateral agreements signed with various trade partners. For instance, the BRICS (Brazil-Russia-India-China-South Africa) initiative in 2010 produced widespread increase in FDI in South Africa. This was despite the insurgence of the global financial crisis during the same period.

As discussed in the ICDT (International Centre for Tax and Development) annual centre meeting in 2012, incentives to lure foreign direct investment have negative implications which are distortionary within the economy. This is brought about by the complexities involved in designing effective incentive structures and weaker administrative capacities of the country. Hence the appropriate fiscal policy would be of a simple tax system with low rates. The tax system should not discriminate between foreign and domestic investors. Furthermore, the corporate tax rates should be congruent to those in capital exporting countries.

Lowering corporate tax rates, ensuring property rights, relaxation of exchange control regulations and lowering real wages serves as other policy measures meant to increase foreign direct investment in South Africa. The implications would be an increase in FDI, which will then excel into economic growth.

**6.4 Limitations of the Study and Areas of Further Research**

The study used total FDI inflows to compute FDI data used in the model. This phenomenon does not distinguish the effect of each sectors’ contribution to economic growth. This has an implication on implementing policies meant to attract the right kind of FDI that South Africa needs.

Quarterly data could be more appropriate in estimating the effect of FDI on economic growth. This is because quarterly data is more frequent and variables are computed at quarterly intervals. Nevertheless, the study used annual data to accommodate the unavailability of quarterly data from the SARB FDI series.
Future research could investigate the effect of FDI on human capital. This emanates from the fact that FDI involves adoption and implementation of new technologies which require training of the existing labour force.
REFERENCES


Huang, H.C., and Chang, Y.K., 2004.”Trade as a Threshold Variable for Multiple Regimes?” Working paper, Tamkang University, Taiwan.


International Centre for Tax and Development (ICDT) ., 2012. Meeting on Africa’s tax structure and fiscal incentives impact on investment. Cape Town, South Africa.


### APPENDIX

#### A.5 (a): ADF and PP Test Results

<table>
<thead>
<tr>
<th>Order of integration</th>
<th>variable</th>
<th>Augmented Dickey-Fuller</th>
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<td>Trend and intercept</td>
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<td></td>
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<tr>
<td>Level LFDI</td>
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<td>0.258</td>
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<tr>
<td>1st diff DFDI</td>
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<td>-2.351</td>
<td>-3.661**</td>
</tr>
<tr>
<td>Level LINVE</td>
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<td>2.735*</td>
<td>-0.033</td>
</tr>
<tr>
<td>Level LREXCH</td>
<td></td>
<td>-2.810*</td>
<td>-3.019</td>
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<td>Level LDEBT</td>
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<td>-3.222</td>
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</table>

*** represents stationary at 1% level of significance

** represents stationary at 5% level of significance

* represents stationary at 10% level of significance

L represents Logarithms of variables

D represents that the variable has been differenced
### A.5 (b) Vector Error Correction Estimates

**Assumption 3**

Vector Error Correction Estimates  
Date: 09/13/12   Time: 13:35  
Sample (adjusted): 1983 2010  
Included observations: 28 after adjustments  
Standard errors in ( ) & t-statistics in [ ]

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<td></td>
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<th>Error Correction:</th>
<th>D(LOGRGDP)</th>
<th>D(LOG_FDI)</th>
<th>D(LOG_INVE)</th>
<th>D(LOG_REXCH)</th>
<th>D(LOG_DEBT)</th>
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</thead>
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<td>(0.70120)</td>
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</tbody>
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\[
\begin{array}{cccccc}
0.02309 & 0.30121 & 0.35140 & 0.10244 & 0.20148 \\
0.40447 & -0.81317 & 0.19512 & 0.34483 & 1.81742 \\
\hline
D(\text{LOG_INVE}(-1)) & 0.044220 & 0.703393 & -0.422807 & -0.194475 & 0.405814 \\
(0.02789) & (0.36374) & (0.42434) & (0.12371) & (0.24330) \\
\hline
D(\text{LOG_INVE}(-2)) & 0.028832 & 0.358059 & -0.051289 & 0.002377 & 0.405814 \\
(0.01976) & (0.25777) & (0.30071) & (0.08767) & (0.17242) \\
[1.45886] & [1.38908] & [-0.17056] & [0.20712] & [0.74825] \\
\hline
D(\text{LOG_REXCH}(-1)) & -0.037377 & -2.539474 & -0.229236 & 0.701363 & -0.302099 \\
(0.09962) & (1.29936) & (1.51585) & (0.44191) & (0.86913) \\
[-0.37519] & [-1.95441] & [-0.15123] & [1.58711] & [-0.34759] \\
\hline
D(\text{LOG_REXCH}(-2)) & -0.058120 & -0.008315 & -0.551072 & 0.088913 & -0.272931 \\
(0.06724) & (0.87701) & (1.02313) & (0.29827) & (0.58662) \\
[-0.86436] & [-0.00948] & [-0.53862] & [0.29810] & [-0.46526] \\
\hline
D(\text{LOG_DEBT}(-1)) & -0.026023 & -0.950931 & -0.106825 & 0.160477 & -0.140556 \\
(0.03419) & (0.44597) & (0.52027) & (0.15167) & (0.29830) \\
[-0.76107] & [-1.95441] & [-0.15123] & [1.58711] & [-0.34759] \\
\hline
D(\text{LOG_DEBT}(-2)) & -0.013218 & -0.422715 & 0.113776 & 0.149512 & -0.122001 \\
(0.02587) & (0.33740) & (0.39362) & (0.11475) & (0.22569) \\
[-0.51097] & [-1.25284] & [0.28905] & [1.05803] & [-0.54058] \\
\hline
C & 0.017388 & 0.519108 & 0.258411 & -0.109559 & 0.284761 \\
(0.01589) & (0.20727) & (0.24181) & (0.07049) & (0.13864) \\
\hline
\end{array}
\]

<table>
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<th>R-squared</th>
<th>Adj. R-squared</th>
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**Determinant resid covariance (dof adj.)**: 1.87E-10
**Determinant resid covariance**: 1.14E-11
**Log likelihood**: 154.0842
**Akaike information criterion**: -3.6363157
**Schwarz criterion**: -3.270540
A.5 (c) Data used in Regression Analysis

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<th>YEAR</th>
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<th>INVE</th>
<th>REXCH</th>
<th>DEBT</th>
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<td>12273</td>
<td>2955</td>
<td>133.9</td>
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<td>1981</td>
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