

**Gordon  
Institute  
of Business  
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University  
of Pretoria

**Examining the influence of foreign direct investment on economic growth in  
South Africa**

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## Abstract

The objective of this study was to examine the influence of foreign direct investment (FDI) on economic growth in South Africa during the period 1994-2014. Time series annual data on GDP growth, FDI, and terms of trade (ToT) were sourced from South African Reserve Bank (SARB) historical macroeconomic statistics online database. The unit root and cointegration properties of the high frequency data were analysed using the Augmented Dickey-Fuller (ADF) criterion and Johansen cointegration test techniques, respectively. The Vector Error Correction (VEC) model was applied to compute both long-run and short-run parameters of the endogenous variables in the model. Results of the long-run section of the cointegrating equation reveal that for every 1 percent upsurge in FDI, there was a statistically significant increase in GDP growth by about 0.05 percentage points during the period 1994-2014. Results for the error correction component of the GDP growth equation show that about 62 percent of the deviance from the long-run stability pathway was rectified in the first year after the deviance occurred. The impulse response functions results show that a one standard deviation in FDI had a favourable effect on future GDP growth after the 1<sup>st</sup> year.

**Keywords:** *FDI, GDP, growth, VEC, South Africa*

## Declaration

I declare that this research project is my own work. It is submitted in partial fulfillment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorization and consent to carry out this research.

Name: Eva de Abreu

Signature:

Date: 05 November 2016

## TABLE OF CONTENTS

Abstract .....	i
Declaration .....	ii
TABLE OF CONTENTS .....	iii
List of Tables .....	vii
List of Figures .....	viii
Chapter 1 .....	1
Introduction to the Research Problem .....	1
1.1 Introduction .....	1
1.2 Background to the study .....	1
1.3 Foreign direct investment in the global economy .....	3
1.4 Necessary conditions for foreign direct investment .....	4
1.5 Conceptual framework .....	7
1.6 Problem statement .....	8
1.7 Research objective .....	9
1.8 Research question .....	9
1.9 Research hypothesis .....	9
1.10 Theories on economic growth .....	9
1.10.1 Harrod-Domar growth model .....	10
1.10.2 The Neoclassical growth model .....	10
1.10.3 New endogenous growth theory .....	11
1.11 Significance of the study .....	11
1.12 Research structure .....	12
1.13 Conclusion .....	13
Chapter 2 .....	14
Literature Review .....	14
2.1. Introduction .....	14
2.2. Some stylized facts on economic growth .....	14
2.3. Theories of FDI .....	16
2.3.1. Perfect competition-based theory of FDI .....	16
2.3.2. Theory of FDI based on imperfect competition .....	17
2.3.2.4. Internalisation theory of FDI .....	21

2.3.3. The theory of FDI based on exchange rate profile or currency strength.....	22
2.3.3.1. Real effective exchange rate .....	22
2.4 Empirical literature.....	23
<b>Chapter 3</b> .....	26
<b>Research Question and Hypothesis</b> .....	26
3.1 Introduction.....	26
3.2 Research question.....	26
3.3 Research hypotheses .....	26
Null hypothesis.....	26
<b>Chapter 4</b> .....	27
<b>Research Methodology</b> .....	27
4.1 Introduction.....	27
4.2 Research design .....	27
4.3 Universe .....	27
4.4 Sampling .....	27
4.5 Unit of analysis .....	28
4.6 Measurement.....	28
4.7 Data.....	28
4.8 Unit Root Tests .....	28
4.9 Vector Autoregressive (VAR) Model.....	29
4.10 VAR Lag Order Selection Criteria .....	30
4.11 Cointegration Test.....	31
4.12 Vector Error Correction Model (VECM) Estimation .....	31
4.13 VEC Granger Causality or Block Exogeneity Wald Test .....	33
4.14 Impulse Response Function (IRF) .....	33
4.15 Cholesky variance decomposition .....	34
4.16 Limitations.....	34
4.17 Conclusion .....	34
<b>Chapter 5</b> .....	36
Results.....	36
5.1 Introduction .....	36
5.2 Summary statistics for the variables.....	36

5.3 Vector Autoregression (VAR) Lag Order Selection Criteria .....	36
5.4 Stationarity tests .....	37
5.5 Cointegration Test Statistics .....	38
5.6 VECM Results .....	39
5.7 Diagnostic Tests of the VECM Residual .....	42
5.8. Impulse Response Function .....	42
5.9 Variance decompositions .....	44
5.10 VEC Model Estimates Stability Test.....	44
5.11 <b>Conclusion</b> .....	45
<b>Chapter 6</b> .....	46
Discussion of Results .....	46
6.1 Introduction .....	46
6.2 Results objective, Research question and Research hypothesis .....	46
6.2.1 Research objective.....	46
6.2.2 Research question.....	46
6.2.3 Research hypothesis.....	46
6.3 Results discussion .....	46
6.4 Conclusion .....	50
Chapter 7 .....	51
Conclusion .....	51
7.1 Introduction .....	51
7.2 Principal findings .....	51
7.3 Implications for government policy makers.....	52
7.4 Implications for academic researchers.....	52
7.5 Suggestions for future research.....	53
References .....	54
Appendices.....	60
Appendix 1: Vector Autoregression (VAR) Estimates.....	60
Appendix 2: VAR Lag Order Selection Criteria .....	61
Appendix 3: Unit Root Tests .....	62
Level and Intercept .....	62
First Difference and Intercept.....	65

Appendix 4: Johansen Cointegration Test.....	68
Appendix 5: Diagnostic Tests.....	69
Normality Test.....	70
Appendix 6: VEC Estimates Stability Test.....	71
Appendix 7: Annual Data Used in the Study.....	72

## List of Tables

Table 5.1: Descriptive statistics.....	35
Table 5.2: VAR Lag Order Selection Criteria.....	36
Table 5.3: Unit Root Tests.....	37
Table 5.4: Cointegration Test Results-No Deterministic Trend, Lag Interval: 1 to 1.....	37
Table 5.5: VEC Model Estimates.....	38
Table 5.6: VEC Granger Causality/Block Exogeneity Wald Tests.....	40
Table 5.7: VEC Model Residual Tests.....	41



## List of Figures

Figure 1.1: South Africa's FDI inflows (% change) and GDP growth (%).....	4
Figure 5.1: Response to a One Standard Deviation over a 21 year (1994-2014) Period.....	41

## Chapter 1

### Introduction to the Research Problem

#### 1.1 Introduction

The theme regarding attainment of sustainable high economic growth has remained a central macroeconomic policy objective in numerous economies. The ambitious goal to achieve sustainable high economic growth has been driven by the desire to address the social and economic challenges experienced by citizens in the country. Among other socioeconomic challenges, South Africa has been experiencing high levels of poverty, unemployment and income inequalities. Such developments have led the nation's macroeconomic policy makers pursue several policies to promote economic growth.

In efforts to stimulate economic growth, foreign direct investment (FDI) is regarded as one of the key instruments that drive growth in countries' production. Preceding economic research which examined the influence of FDI on GDP growth in diverse economies have reported conflicting results. For instance, Gul & Naseem (2015) report that in Pakistan FDI had a negative influence on economic growth, while Abala (2014) reported that FDI had a positive influence on economic growth in Kenya. While some studies provide a good empirical foundation for understanding the influence of FDI on GDP growth of a country, recent studies of the relationship between FDI and economic growth in South Africa is not available; hence the goal of this study is to update the literature on this important relationship.

#### 1.2 Background to the study

Soon after democratic elections in 1994, the government adopted the Reconstruction and Development Programme (RDP), a socio-economic development programme advocating for greater equity as the basis for long-term development and growth (Government of South Africa, 2011). The programme encompassed interventions aimed at stimulating the economy in respect of fiscal spending, tax reductions, reductions in government borrowing, and trade liberalization. The RDP was then replaced by a macro-economic policy framework called the Growth, Employment and Redistribution (GEAR) in 1996. The GEAR was aimed at achieving sustained annual

real GDP growth of at least 6% by the end of 2000, creating four hundred thousand new jobs each year, trade and financial liberalization, increasing employment and reducing poverty (Mahembe & Odhiambo, 2013). Following the shortcomings of the GEAR, government further adopted a new macroeconomic policy in 2006 called Accelerated and Shared Growth Initiative for South Africa (ASGISA).

Driven by the broad goal to address social and economic challenges such as high levels of unemployment and poverty in the country, achievement of significant FDI inflows has been one of the central policy objectives in South Africa since attainment of democracy in 1994. The government has pursued numerous policies towards promotion of foreign direct investment (FDI) inflows to augment the existing capital stock in production and stimulate economic growth. In addition to implementation of investment promotion strategies; Some of these are briefly listed here: the Reconstruction and Development Programme (RDP) implemented in 1994, the Growth Employment and Redistribution (GEAR) implemented in 1996, Accelerated and Shared Growth Initiative for South Africa (ASGISA) implemented in 2007, the New Growth Path (NGP) implemented in 2010, and the New Development Plan (NDP) implemented in 2013 (Koma, 2013).

The respective policy frameworks were designed as integrated coherent social and macroeconomic strategies aimed at mobilising citizens and the country's resources in an effort to building a democratic future for all citizens. The core elements of the integrated strategy included the reduction of the fiscal deficit to contain debt service obligations, countering inflation to free resources for investment, maintaining an exchange rate policy that keeps the real effective exchange rate stable at competitive levels, steady relaxation of exchange controls, minimisation of exchange rate depreciations, provision of tax incentives to stimulate investment in labour absorbing projects, and expansion of trade and investment flows in the Southern African region (Koma, 2013). According to Pietersen (2015), South Africa's performance in stimulating increased FDI stock inflows remains a matter of serious concern in respect of its low contribution to the world FDI flows.

### **1.3 Foreign direct investment in the global economy**

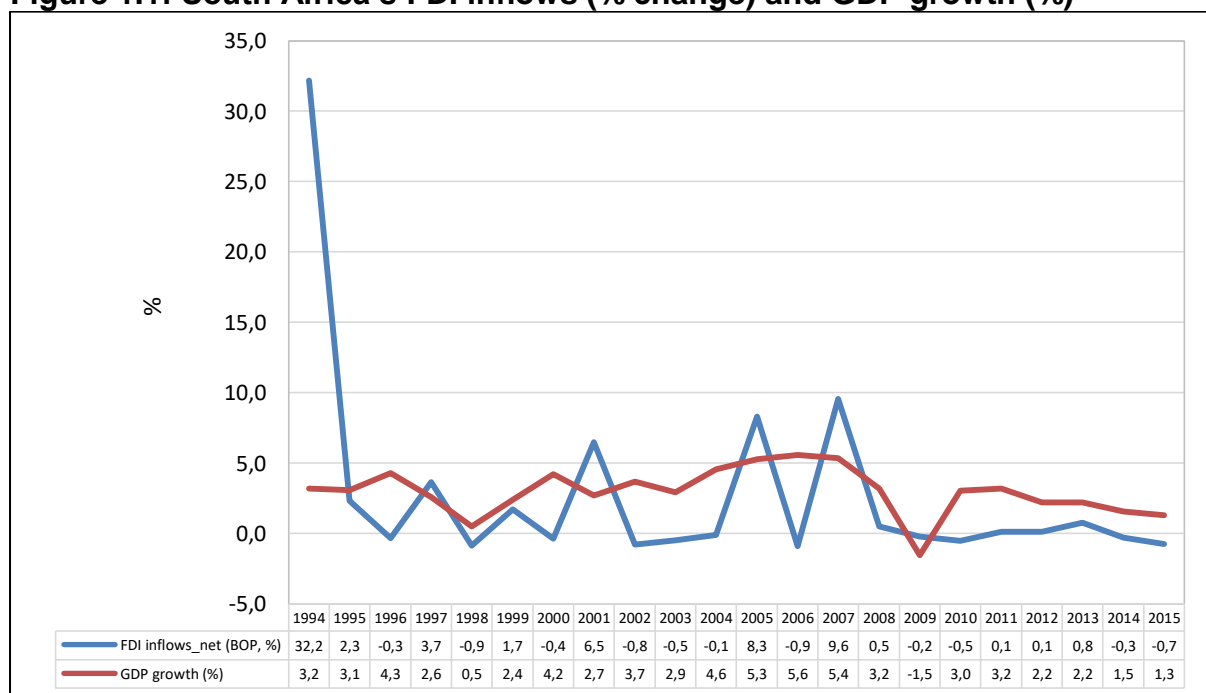
The globalization of the world economy has created enormous new opportunities for attraction of foreign direct investment (FDI) in developing and emerging economies (Musa & Ibrahim, 2014). Globalization is driven by a number of factors which largely include size and growth prospects of economies of host nations, availability of efficient production facilities, population sizes, growing foreign market opportunities, basic infrastructural facilities, natural resources, cheap and competitive labour, strong economic growth prospects, sound macroeconomic policies, social and political stability, low country risk-profiles, sound business tax policy regimes and industrial support facilities (Suny Levin Institute, 2016).

The quality of labour force in a nation with regards to productivity also acts as mechanism in determining investment hence stimulating globalization. For example, in regions like China where the government took vigorous step towards enhancing the productivity levels of their labour force, investment by foreign investors has been growing at an increasing rate for many years (Roelfsema & Zhang, 2012). The policy adopted by the Chinese government that each Chinese national must attend compulsorily education and learning for a minimum of nine years contributed in improving the quality of the labour force in the China, thus attracting international investments from foreign nations to the enhancement of globalization. The existence of natural resources creates paths for investors to be interested to invest in those countries (Roelfsema & Zhang, 2012).

Countries that have the potential to spread their business support to investors abroad and also possess the ability to get entrance to world markets, have a higher probability of getting participation globally. Some research studies reveal that in the recent years, a considerable number of nations have changed their positions in relation to the benefits associated with globalization (Suny Levin Institute, 2016). Some countries did rearrange their labour market and macroeconomic policies in an effort to accommodate and provide for the interests of foreign investors. The same countries also improved and strengthened their legal structures in order to attract foreign direct capital inflows (Roelfsema & Zhang, 2012). Apart from stimulating economic growth, FDIs also promotes increases in technology, management skills,

local market competition, job creation, technical know-how and access to global markets (Okafor, 2014). The effects of FDI from the target country standpoint have been examined comprehensively. Nonetheless, findings from most previous similar studies which include Omanwa (2013), Sankran (2015) and Tun, Azman-Saini & Law (2012) are contradictory. Through the multiplier effect, FDIs transmitted by multinational corporations are associated with numerous positive welfare effects on the recipient country. Based on data from the World Bank (2016), Figure 1 shows evidence of growth in FDI inflows into South Africa between 1994 and 2015.

**Figure 1.1: South Africa’s FDI inflows (% change) and GDP growth (%)**



Source: World Bank (2016)

The trends of growth in FDI net inflows and gross domestic product (Figure 1) demonstrate evidence of volatile FDI inflows between 1994 and 2008, while the drop in economic growth was imminent during 2009 when the rate reached -0.2% down from 9.6% during 2007.

#### 1.4 Necessary conditions for foreign direct investment

Pietersen (2015) accentuates that in order to increase the stock of FDI inflows, domestic business conditions from numerous frontiers need to be conducive to

attract foreign investors. Numerous business environmental frontiers such as political stability, rule of law, ease of doing business, institutional quality, and trade openness, the exchange rate regime in the country plays a significant role in attraction of FDI into numerous economies. In South Africa, there is a flexible exchange rate regime, such that the central bank does not intervene in the market to influence exchange rate movements. In a flexible exchange rate system, growth in money supply leads to imbalances in the financial sector, which largely comprises of the money market and capital market. Assuming constant or insignificant growth in national output, the growth in money supply (Ms) will translate to increase in demand for money (Md) for transactionary and precautionary motives. Based on the Keynesian approach, the demand for money transactionary motive and precautionary motive remains inelastic to interest rate variations. Consequently, the currency depreciates against the currencies of the trading partner countries, and exports increase following the J-curve effect of the Marshall Learner condition.

Therefore, stability of the money demand function remains a cornerstone of monetary policy effectiveness. Instability of the function makes it difficult to influence the level of economic activity in the domestic production or real sector. As such, money demand stability is a necessary condition to establish a direct link between monetary aggregates and nominal income (Y). Provided below is a model that demonstrates exchange market pressure and degree of central bank intervention.

$$d(Md) = \beta_0 + (d)p_t + \beta_1 (d)c_t - \beta_2(d)r_t \quad \text{----- (1)}$$

$$d(p_t) = \alpha_0 + \alpha_1 d(P_t^*) + \alpha_2 d(er_t) \quad \text{----- (2)}$$

$$d(r_t) = d(r_t^*) + E_t(d(er_{t+1})) - d(er_t) \quad \text{----- (3)}$$

$$d(Ms) = d(D_t) + (1 - \lambda)d(r_t) \quad \text{----- (4)}$$

$$d(r_t) = -p_t(d(u)) \quad \text{----- (5)}$$

$$d(D_t^a) = \gamma_0 + d(y_t) + (1 - \gamma_1)d(P_t) - \gamma_2 y\_gap_t \quad \text{-----}$$

(6)

$$d(Md)_t = d(Ms)_t \quad \text{----- (7)}$$

→

$$d(Ms)_t \approx \frac{k(D_t+R_t) - k(D_{t-1}+R_{t-1})}{k(D_{t-1}+R_{t-1})} \quad \text{----- (8)}$$

$$d(D_T) = d(D_t) + d(D_t) \quad \text{----- (9)}$$

$$d(D_t) = -\lambda d(R_t)$$

$$B_t = D_t + R_t$$

Hence:

$$d(Ms)_t = \frac{d(B_t)}{B_{t-1}} \approx \frac{d(D_t) - \lambda d(R_t) + d(R_t)}{B_{t-1}}$$

$$= \frac{d(D_t)}{B_{t-1}} + (1 - \lambda) \frac{d(R_t)}{B_{t-1}} \quad \text{----- (10)}$$

$$= d(D_t) + (1 - \lambda)d(r_t)$$

Where:

Md represents money demand

Ms denotes money stock or money supply

Pt symbolises price level in the domestic economy

Ct represents national income

yt denotes national output or production

r symbolises the interest rate in the economy

er represents the nominal exchange rate

Dt denotes credit in the local economy

Rt represents reserves of foreign currency

Bt symbolises the base of money supply

The implication of the model above holds the assumption that monetary authorities remain autonomous to changes in local credit to affect general economic trends.

### 1.5 Conceptual framework

Capital at any given time ( $K_t$ ) is considered to consist of human capital at time period  $t$ ,  $K_t^h$  and physical capital at time period  $t$ ,  $K_t^p$ ; such that:

$$K_t = K_t^h + K_t^p \quad \text{----- (11)}$$

Physical capital comprises domestic capital,  $K_t^d$  and foreign capital  $K_t^f$  therefore can be expressed as follows:

$$K_t^p = K_t^f + K_t^d \quad \text{----- (12)}$$

Starting from an augmented Cobb-Douglas production function in which the output ( $Y_t$ ) per capita depends on,  $K_t^f, K_t^d$  and  $K_t^h$ . The conventional Cobb-Douglas production function can be specified as shown in equation 2:

$$Y_t = A(K_t^f)^\alpha (K_t^d)^\varphi (K_t^h)^{1-\alpha-\varphi} : \quad (\alpha + \varphi + (1-\alpha-\varphi)) = 1 \quad \text{----- (13)}$$

where:

$\alpha$  represents the elasticity of production with respect to  $K_t^f$ ,

$\varphi$  denotes the elasticity of production with respect to  $K_t^d$ , and

$1-\alpha-\varphi$  represents the elasticity of production with respect to  $K_t^h$ .

With the assumption that the national output function exhibits fixed returns to scale, the national output function can be written in its intensive form as:

$$y_t = A(k_t^f)^\alpha (k_t^d)^\varphi \quad \text{----- (14)}$$



Where  $y_t$  is the output per capita,  $\frac{Y_t}{K_t^h}$ ,  $k_t^f$  is the foreign capital per unit of effective labour,  $\frac{K_t^f}{K_t^h}$  and  $k_t^d$  is the domestic capital per unit of effective labour,  $\frac{K_t^d}{K_t^h}$ .

The first log differences of equation 14 yields equation 15.

$$d(\ln y_t) = d(\ln A_t) + \alpha \ln k_t^f + \varphi \ln k_t^d \quad \text{-----}$$

(15)

Decomposing  $d(\ln A_t)$  into its observable and unobservable components, we obtain equation (16) where the observable component is the growth-enhancing effect of institutional quality of FDI.

$$d(\ln(A_t)) = \delta_{A0} + \delta_{A1} (\ln k_t^f) \quad \text{----- (16)}$$

where: the first term to the LHS of the function (equation 16) is in differenced form.

Among other factors, market demand and market size, investment environment, country risk and cheap labour play a fundamental role towards the attraction of more investments (Abdoulaye, Xie, & Oji-Okoro, 2015). Some previous related studies around FDI attraction accentuate that the aforementioned factors remain important for entrepreneurs and investors in making make rational business decisions on the choice of location for investments (Monaghan, 2012; and Kumar & Siddharthan, 2013). Following Kumar & Siddharthan (2013), in addition to host country capital, foreign investment flows are also driven through technology and access to new markets. From a real practice standpoint, FDI provides valuable capital that stimulates economic growth, helps reduce unemployment levels and ensures access to foreign markets and transfers of technology (El-Wassal, 2012; Al-Khoury & Abdul Khalik, 2013; Sherif & Dalia, 2014 and Anyanwu & Yameogo, 2015).

## 1.6 Problem statement

South Africa is considered a low-risk investment destination for investors and exports more than 25% of its manufactured products to the African continent (Mahembe &

Odhiambo, 2013). Through investment incentives and industrial financing interventions, the government aggressively seeks to boost attraction of foreign capital inflows. According to the 2015 United Nations World Investment Report released at the United Nations Conference on Trade and Development, foreign direct investment flows into South Africa plunged by 31.2% to \$5.8 billion in 2014 down from \$8.3-billion in 2013 (UNCTAD, 2015). In light of this background, South Africa's economic growth is likely to remain sluggish over the coming years; hence the country faces daunting challenges in competing with other emerging economies for foreign investment (HDR, 2012) for stimulating economic growth. This study therefore aims to scrutinise the influence of foreign direct investment on GDP growth in South Africa during the sample period 1994 – 2014.

### **1.7 Research objective**

In respect of the problem statement highlighted above, the objectives of this study are:

- To examine the influence of foreign direct investment on economic growth in South Africa during the period 1994-2014.

### **1.8 Research question**

- What is the influence of foreign direct investment on economic growth in South Africa during the period 1994-2014?

### **1.9 Research hypothesis**

- Foreign direct investment has a statistically significant and positive influence on economic growth in South Africa.

### **1.10 Theories on economic growth**

Theories on economic growth have existed for numerous years and provide a basis for understanding the role played by direct investments on economic growth in countries (Anyanwu, 2012 & Awan, 2013). Following Hill (2013) and Aregbesola (2014), the theories discussed in this study are the Keynesian growth theory portrayed by the Harrod-Domar growth model, the Neo-classical growth theory and new endogenous growth theory.

### 1.10.1 Harrod-Domar growth model

This growth model, which represents the Keynesian view, models growth as an outcome of the equilibrium between saving and investment. Harrod-Domar developed the model to explain the rate of growth in income that would induce equilibrium between saving and investment. The central variables in the model are capital accumulation and the proportion of change in production to an adjustment in investment represented by  $\Delta K$  and  $\Delta K/\Delta Y$ ; respectively. The change in output results from the change in capital stock ( $\Delta Y = \Delta K$ ), while the change in capital stock results from investment, hence  $\Delta K = I$ . As such, investment contributes to aggregate demand via the multiplier and also increases supply through expansion of productive capacity.

### 1.10.2 The Neoclassical growth model

This model entails that the rate of improvement in output (GDP) is increased by the share of output devoted to investment, reduced by the rate at which the physical capital stock depreciates, and increased by growth in technology or total factor productivity. The model assumes that technological progress is exogenously determined and its level remains the same across different countries. Following Kumar & Siddharthan (2013), the model makes use of the Cobb-Douglas production function and makes three assumptions:

- i. the labour force growth is constant,
- ii. all savings are invested, that is saving (S), investment (I) and the propensity to save ( $sY$ ) are all equal, and
- iii. output (Y) is determined by the interaction of capital and labour given by the function:

$$Y = f(K, L) \quad \text{----- (17)}$$

The production function specified above (eqn 1) shows increasing returns to scale and decreasing returns to scale of the variable when the other factor is held constant. The three assumptions specified explain the process through which the economy reaches a steady-state level of growth when capital per labour unit and the investment requirement are in equilibrium. The model stresses that the rise in labour

supply or investment in equipment and machinery increases productivity. Technological change brought about by investment contributes to productivity through invention and innovation.

### **1.10.3 New endogenous growth theory**

This theory endeavours to address the shortcomings of the neoclassical growth model (Johnson, Toledano, Strauss & James, 2013). The neoclassical growth model assumes that technological change is exogenously determined in explaining long-run economic growth and this has failed to explain differences in technologies across countries, which explain why some countries are richer than others. In the new growth theory, technology is modelled to be endogenously determined and is envisaged in the model by incorporating research and development as the channel that produces new ideas.

The generated ideas are then used to manufacture capital goods in monopolistic competition which allows researchers to earn profit from their efforts. The new endogenous growth theory makes three conventions which specify that technological change is central to the generation of long-run growth; technological improvement is mainly influenced by actions of agents who respond to market incentives, and the cost of production is incurred only once, and ideas can be used several times without attracting further costs.

### **1.11 Significance of the study**

Many studies examining the nexus between FDI and economic advancement in terms of national output have not been conducted in context of the post-apartheid era in South Africa. This study aims to fill in that gap and provide insights at both academic and policy platforms on the relationship between FDI and improvement in production of national output in South Africa. Finally, the empirical results from this research study are expected to provide strong insights to academic researchers and government economic policy-makers in the form of additional recent empirical evidence relevant for use in making economy-wide policy decisions regarding the role FDI has on the stimulation of national production capacity. Academics would also be provided with recent empirical evidence on the association between FDI and economic growth.

## 1.12 Research structure

Chapter 1: Introduction to the Research Problem - This chapter provides the introduction and background to the study, foreign direct investment in the global economy, necessary conditions for foreign direct investment, conceptual framework, problem statement, research objective, research question, research hypothesis, theories on economic growth, and significance of the study, limitations of the study, research structure, and conclusion.

Chapter 2: Literature Review – This chapter provides some stylized facts about the relationship between foreign direct investment and economic growth; conceptual framework, theoretical and empirical literature on foreign direct investment and economic growth nexus.

Chapter 3: The research question and research hypothesis, as well as the alternative hypothesis, are provided in this chapter.

Chapter 4: Research Methodology – This chapter discusses the data with respect to the variables to be used in the study and the sources from which data were obtained. The chapter also addresses the methodological procedure and estimation technique applied in estimation of the results. Time-series tests were performed on the data series prior to estimation of final empirical results in EViews software program.

Chapter 5: Results – This chapters presents, analyses and interprets the results of the findings of the study. The results discussed include the time series properties of data and empirical estimates derived from the econometric analysis.

Chapter 6: This chapter provides a discussion of the results found in this study. The results are discussed in line with findings found and reported in preceding studies.

Chapter 7: Conclusions – Subsequent to the discussion of the findings, this chapter provides a summarized account of the principal findings of the research prior to the provision of recommendations. Some recommendations to government policy

makers and academic researchers were made. Furthermore, suggestions for future research was made in line with the findings from the study.

### **1.13 Conclusion**

This research study aims to examine the influence of foreign direct investment on economic growth in South Africa during the period 1994-2014. This chapter presents the introduction and background to the study, foreign direct investment in the global economy, necessary conditions for foreign direct investment, conceptual framework, problem statement, research objective, research question, research hypothesis, theories on economic growth, and significance of the study, limitations of the study, research structure, and conclusion. The next chapter discussed some stylized facts on foreign direct investment and economic growth, and theoretical and empirical literature on the nexus between foreign direct investment and economic growth.

## Chapter 2

### Literature Review

#### 2.1. Introduction

This chapter presents a review of both theoretical and empirical literature on the effect of foreign direct investment and economic growth. The chapter is divided into four main sections. Section 2.2 provides some stylised facts on the theory of economic growth. Section 2.3 presents some literature on theories of foreign direct investment (FDI). Section 2.4 presents empirical evidence from past studies on the effects of FDI on national output growth, while Section 2.5 provides the conclusion of the chapter.

#### 2.2. Some stylized facts on economic growth

Based on the orthodox neoclassical growth model, steady state growth in an economy is significantly driven by exogenous variables; for which foreign direct investment remains one of the significant predictors (Jones, 2015). It is against this background that foreign direct investment in the form of physical stock can be modeled separately as a determinant of national output growth given its major contribution to capital accumulation. Thus, capital accumulation in an economy from foreign direct investment (physical stock) significantly impacts on national output growth in both short-run and long-run periods. Following Jones (2015), the stylized foreign direct investment driven growth model borrows from the specification of aggregate output ( $Y$ ) in an economy at the current period  $t$  as a function of infrastructure capital ( $G$ ), other capital ( $K$ ) and labour ( $L$ ), such that:

$$Y_t = A_t K_t^\alpha G_t^\beta L_t^{1-\alpha-\beta} \quad \text{----- (18)}$$

Where  $A_t$  the aggregate factor productivity at time period  $t$ ; assuming a fixed savings rate ( $s$ ) and that infrastructure capital and other capital fully depreciate each period so that the next period's infrastructure resulting from foreign direct investment being a proportion of total investment  $I$  an economy becomes:

$$G_{t+1} = \tau_t Y_t \quad \text{----- (19)}$$

Given the condition in equation (19), investment in non-infrastructure becomes:

$$K_{t+1} = (1 - \omega_t) s Y_t \quad \text{-----}$$

(20)

Substituting the capital accumulation equations (19) and (20) into the production function produces a difference equation for the evolution of per capita output as:

$$(Y/K)_{t+1} = A_{t+1} s^\alpha (1 - \omega_t)^\alpha \omega_t^\beta (Y/L)_t^{\alpha+\beta} (L_t/L_{t+1})^{\alpha+\beta} \quad \text{-----} \quad (21)$$

Following Todaro and Smith (2012), the Harrod-Domar growth model specifies that saving is a necessary condition for growth; hence economies should reserve certain proportions of national income as savings to replace impaired capital stocks. Linking savings and new capital goods from foreign direct investment inflows, the aggregate physical capital grows based on the function:

$$K_{t+1} = (1 - v) K_t + I_t \quad \text{-----} \quad (22)$$

When savings grow at a constant rate, per capita capital accumulation evolves as:

$$\begin{aligned} K_{t+1} &= (1 - v) K_t + I_t \\ &= (1 - v) K_t + S_t \\ &= (1 - v) K_t + s Y_t \quad \text{-----} \\ &= (1 - v) K_t + s A K_t^\sigma N_t^{1-\sigma} \end{aligned}$$

(23)

Integrating the above formulations into the Solow growth model, the complete economic model translates into the labour capital augmented output function where labour capital is factored in as a complementary regressor, yielding:

$$\Rightarrow \frac{K_{t+1}}{N_t} = (1 - d) \frac{K_t}{N_t} + s A \frac{K_t^\sigma}{N_t} = (1 - d) \frac{K_t}{N_t} + s A \frac{K_t^\sigma N_t^{(1-\sigma)}}{N_t^\sigma N_t^{(1-\sigma)}} \quad \text{-----} \quad (24)$$

$$\Rightarrow \frac{N_{t+1}}{N_t} \times \frac{K_{t+1}}{N_{t+1}} = (1 - d) \frac{K_t}{N_t} + s A \frac{K_t^\sigma}{N_t^\sigma} \quad \text{-----}$$

(25)

$$\Rightarrow (1 + n) k_{t+1} = (1 - d) k_t + s A k_t^\sigma \quad \text{-----} \quad (26)$$



Hence, the steady state economic growth becomes:

$$k_{t+1} = \left( \frac{1-d}{1+n} \right) k_t + \frac{sA}{1+n} k_t^\sigma . \quad \text{----- (27)}$$

Nonetheless, the basic form of the neoclassical model integrates to estimate the possible approximate contribution each set of additional physical capital stock can make towards growth of productivity and output. The standard augmented production function induced from foreign direct investment yields the output growth function:

$$Y_t = K(t)^\sigma H(t)^\beta (A(t)L(t))^{1-\sigma-\beta} \quad \text{----- (28)}$$

Where: Y, K, H, A and L denote national output (GDP); total capital from foreign direct investment, labour capital, state of technological progress and labour productivity; respectively. With  $\sigma + \beta < 1$ , the national output function exhibits diminishing returns to scale (Jones, 2015).

### 2.3. Theories of FDI

The major theories on FDI are based on three major assumptions of market conditions. Specifically, the market conditions include perfect competition, imperfect competition, and currency-based or exchange rate conditions (Nayak & Choudhury, 2014). Given that FDI primarily occurs through multinational corporations, the flows of FDI across countries is regarded to be a reason for the existence of market imperfections as well as monopolistic and oligopolistic advantages (Nayak & Choudhury, 2014).

#### 2.3.1. Perfect competition-based theory of FDI

The theory of FDI founded on perfect competition centres on the assumption of free movement or flow of capital from the investing or home country to the recipient or country. Moreover, the model of this theory assumes that there are two nations for which their individual capital prices (interest rates) equal their respective marginal productivity levels. When there is free capital flows or movements between the two countries, the marginal productivity of capital inclines to be equalised between the two nations. Correspondingly, the marginal productivity of labour between the two

countries is assumed to be equal. Based on this theory, past studies found that following foreign direct investment, the output of the investing country decreased without leading to a parallel decrease in national income of the nation (Nayak & Choudhury, 2014).

Furthermore, studies indicate that the existence of business mergers and purchases play a substantial part in the flows of FDI between and across countries. The terms “*mergers*” and “*acquisitions*” are conceptually regarded to have the same meaning even though, technically, they are slightly different. The treatment of mergers and acquisitions is basically the same since their competition concerns are similar. Conceptually, an acquisition occurs when one firm obtains both ownership and control, in complete or in part, of another entity or business interest. It does not essentially involve incorporation or alliance of firms (Hackbarth & Miao, 2015).

In an acquisition transaction, even when there is complete change in control, the firms involved may continue to operate as separate entities. On the other hand, the definition of the term “merger” includes an acquisition. Therefore, a merger happens when a single or more than one entity unswervingly or meanderingly *purchase* or *create* undeviating or incidental control over the complete or part of the business of another firm. In a merger transaction, parties involved cannot continue to operate in the market as separate entities as in the case of an acquisition. Instead, parties to the acquisition transaction lose their original individual identities following the transaction (Hackbarth & Miao, 2015).

### **2.3.2. Theory of FDI based on imperfect competition**

The existence of imperfect market conditions in the real world is broadly explained by five approaches; namely the industrial organisation approach, monopolistic power, oligopolistic theory, internalisation approach and eclectic paradigm (Mazenda, 2012; Nayak & Choudhury, 2014; and Hackbarth & Miao, 2015).

#### **2.3.2.1. The industrial organisation approach**

According to Nayak & Choudhury (2014), the industrial organisation approach points out that international production occurs within an imperfect market conditions framework. Mazenda (2012) also elaborates that the two major points on which the

industrial organisation theory centres, include competitive advantage and the ability to maximise profits. In real practice, corporations with production operations overseas actually compete with local firms which have an advantageous standing with respect to labour legislation on wage determination, culture, ease of doing business, language and consumer preferences. In light of the fact that foreign corporations have a relatively greater likelihood of exposure to foreign exchange risk, such drawbacks are counterbalanced by practice of some degree of market power to ensure profitability of international investments. The common sources of market power include technology patents, economies of scale, and marketing skills (Nayak & Choudhury, 2014).

From an economic standpoint, market power refers to power over price. For example, amalgamation of the integrating entities' operations can generate or enhance market power, thereby enabling the amalgamated entity to increase prices by decreasing production unilaterally. In tightly oligopolistic markets with distinguished merchandises, companies have some amount of power in the market, though not sufficient to be regarded leading. Since the demand curve in differentiated product markets is downward sloping, a unilateral increase in price by a firm would lead to a loss in some of the firms' sales (Hackbarth & Miao, 2015). The fact that the loss in sales resulting from a price rise is not absolute in nature, gives the foreign firm some power over price; for which the degree of market power can be measured using the Lerner index specified as:

$$m = \frac{(pr - mc)}{pr} \text{----- (29)}$$

where m denotes market power,

pr represents price,

mc denotes short-run marginal cost (SRMC).

The index is essentially the LHS of the condition for maximising profit is specified as:

$$\frac{(pr - mc)}{pr} = \frac{1}{elasticity} \text{----- (30)}$$

The index is therefore the inverse of the error term of demand elasticity used to measure the organisation's influence in the market (Hackbarth & Miao, 2015). From the several sources of power, technology patents provide the greatest advantage to

international firms in the sense that technology inventions facilitate the introduction of new products in both existing and new markets (Nayak & Choudhury, 2014). Since markets are imperfect in the real world, foreign firms attempt to exercise market power to maximise profits from investments abroad.

### **2.3.2.2. FDI theory based on monopolistic power**

Nayak & Choudhury (2014) state that multinational corporations enjoy their monopolistic powers only when imperfect market conditions exist, brought about by factors like patents, superior technology, production economies of scale, marketing economies of scale and managerial expertise. Where such advantages exist, foreign firms have an incentive to establish investments in foreign countries to exploit and maximise returns or profits from the respective foreign markets. In circumstances where the prospects of making monopoly profits exist, foreign firms get encouraged to directly invest in international markets normally when barriers to entry are minimum. Following Hackbarth & Miao (2015), prior to entrance into a certain sector by a foreign company, the potential to penetrate that sector should exist first. Therefore, it is crucial to note that there are different views on factors regarded to constitute barriers to entering a market. There are several conditions that exist in numerous sectors, which stand as barriers to entry by other companies.

### **2.3.2.3. Oligopolistic theory of FDI**

The foundation of this theory is based on the assumption that market imperfections create opportunities for maximising investment returns as a result of strategic location. The primary motives foreign firms have in establishing new facilities are centred on seeking of improved access to host nation's markets, and use of relatively cheaper abundant factors in the host country (Nayak & Choudhury, 2014). Specifically, firms participating in the oligopolistic market structure tend to follow decisions of other firms with regards to location. In light of the background that foreign firms investing in foreign markets remain uncertain about the operating costs they are likely to incur in the host nation, entrance into the market by the respective foreign firms leads to changes in market concentration in the host countries (Nayak & Choudhury, 2014).

In circumstances where the level of market concentration falls below a certain level, neither dominance nor market power is likely to cause a problem in the relevant market. However, in situations where market concentration levels are high, a detailed analysis on whether or not FDI will bring along with it productive gains to the host nation is merited, though that does not necessarily entail that entry into the market by foreign firms presumes anti-competitiveness. A high degree of market concentration alone is not enough to justify the conclusion that the conduct will create, enhance or maintain market power. The two common computations or parameters used to assess market concentration, namely the Herfindahl Hirschman Index (HHI) and the Four Firm Concentration Ratio (CR4), have to be analysed. The HHI is the summation of squared market shares of all companies in the sector, while the CR4 is the aggregate of market shares of the first four largest firms in the relevant market (Hackbarth & Miao, 2015).

Furthermore, Hackbarth & Miao (2012) accentuate that cartels which commonly occur in oligopolistic markets are associated with high degrees of market exclusion. Conceptually, cartels are a form of collusive agreement between oligopolists whereby parties agree on certain conduct such as prices to charge, allocation of markets and collusive tendering. The practice of collusion is commonly applicable in oligopolistic markets where relevant industries are dominated by small numbers of few large firms. The essential feature recognised by oligopolistic firms is that their actions are interdependent, that is, an action by one firm influences the behaviour of other rivals. For instance, a manipulation in either price or output by one firm will cause other rival firms to retaliate (Hackbarth & Miao, 2012).

In order to establish or possess a certain degree of market control, oligopolistic firms frequently engage in collusion, which in practice, takes two forms namely, *explicit* collusion and *tacit* collusion. In most circumstances, collusion becomes successful only when agreements are enforceable. Explicit collusion occurs when there are formal agreements or understandings. Tacit collusion occurs without formal agreements. Firms may decide not to compete robustly on price since establishment of mutually beneficial prices may be difficult given the likely differences in cost structures. Under formal collusive agreements, firms face the incentive to cheat since they may lack information about prevailing market conditions. In situations

where there is existence of such *information asymmetries*, actions by rival firms may be misinterpreted as cheating, thus provoking a response from other rivals (Hackbarth & Miao, 2012). Oligopolistic firms frequently compete in the form of non-price competition such as product development, market allocation and collusive tenders. Price competition is normally avoided since it is positively associated with the potential to drive down the average industry price. Each firm acts *strategically* since its profits depend not only on its own actions, but also on actions of other firms (Hackbarth & Miao, 2012).

#### **2.3.2.4. Internalisation theory of FDI**

This internalisation theory, also referred to as micro-level theory of FDI, puts emphasis on intermediate production inputs and technology (Nayak & Choudhury, 2014). The investment decisions to establish investments abroad depend on firm-level and industry-level specific factors rather than country-specific aspects and capital availability in the host nations (Mazenda, 2012; and Nayak & Choudhury, 2014). The three postulations upon which this theory was formulated are as follows:

- (i) Firms tend to maximise their profits in markets that are imperfect in nature,
- (ii) Markets in intermediate products provide an incentive to create internal markets, and
- (iii) Multinational corporations (MNCs) emerge from internalisation of markets across the global economy.

In order to secure and maintain market positions, firms investing in foreign markets can engage in either backward or forward integration. Whether integration occurs in the form of frontward or regressive integration, the freshly purchased company may choose to contract with the acquiring firm, thus modifying rivalry among acquiring company's suppliers, clients and contestants. Such odds increase the anxiety that perpendicular amalgamation can exclude contestants by restraining their entrance to sources of resource supply or to clientele.

#### **2.3.2.5. Eclectic paradigm of FDI**

Nayak & Choudhury (2014) indicate that this paradigm explains that a MNC can engage in foreign direct investment only if three conditions abbreviated together as OIL (ownership, internalisation, and location) are all satisfied; namely:

- (i) The foreign firm should possess ownership advantages relative to other firms,
- (ii) There is potential to derive benefits from internalisation of advantages, and
- (iii) There are advantages the firm can enjoy from foreign location.

The paradigm explains a foreign firm should have unique leads to operate abroad.

### **2.3.3. The theory of FDI based on exchange rate profile or currency strength**

According to Nayak & Choudhury (2014), the exchange rate profile or strength of a specific country's currency relative to the basket of other nations' currencies has a substantial part in influencing the flows of FDI. Numerous international finance policy discussions on the subject of international finance accentuate that low and diminishing levels of foreign direct investments experienced by many developing nations are also a result of maintenance of inappropriate exchange rates for protracted periods. There is growing evidence that prolonged real exchange rate misalignment, which commonly occurs in form of overvaluation, leads to collapse of foreign direct investment.

Exchange rate overvaluation exists when the genuine exchange rate is below the balanced genuine exchange rate value (Ganyaupfu, 2013). Research evidence from the bulk of literature linked to this subject consistently reveals that countries that have properly managed their exchange rates, thus avoiding real exchange rate appreciations, have been more successful in promoting growth of their exports in the medium to long run (Ganyaupfu, 2013). Therefore, maintaining the real exchange rate at "wrong levels" generates incorrect signals in the external sector and greatly impairs international export competitiveness of any given country. Since any given country trades with a basket of other countries, the most reliable indicator of the strength of a country's currency are the index called the real effective exchange rate (REER).

#### **2.3.3.1. Real effective exchange rate**

This index is calculated by obtaining trading weights for a given country's major trading partners. In computing the REER index is expressed by the function below:

$$REER_t = \Pi_i \left[ \left( \frac{er_{it}}{er_{i0}} \right) * \left( \frac{P^d}{P^f} \right) \right]^{W_i} \times 100 \quad \text{----- (31)}$$

where:

$\Pi_i$  = multiplication of a given country's exchange rate versus trade partner countries' currencies, adjusted for relative prices based on the purchasing power parity theory considering the investing country's normalized trade weight ( $W_i$ ),

$er_{it}$  = country i's exchange rate during time t

$er_{i0}$  = country i's exchange rate time 0,

$P^d$  = price level in the domestic economy during time t, and

$P^f$  = price level in the foreign country during time t.

## 2.4 Empirical literature

Although there exist substantial empirical literature on the influence of external direct investment on national output growth, the empirical evidence currently remains limited in context of South Africa in particular. Thus, this section presents empirical evidence on the effect of foreign direct investment on economic growth in numerous nations.

In analysing the dynamic stimuli of FDI on national output growth rate in Nepal, Adhikary (2015) applied the vector error correction (VEC) model to determine whether or not there was a long-term relationship between FDI and national output growth utilising annual time series data for the sample period 1985-2012. Estimates derived after the VEC-based Granger-Causality test was performed provided evidence that FDI had a statistically a substantial favourable effect on national output growth during the sample period 1985-2012. Nonetheless, the results from the impulse response analysis performed indicated that the relationship between FDI and economic growth in Nepal was not stable in volatile times during the period 1985-2012.

Gudaro, Chhapra & Sheikh (2012) analysed the influence of external direct investment on economic growth in Pakistan during the sample period 1981 to 2010. Multiple regressions were employed to examine the link between national gross



domestic product (GDP) and overseas direct investment in which GDP was the dependent variable. The estimated results reveal a positive and significant association of gross domestic product and foreign direct investment. The study concludes that foreign direct investment is an essential instrument for national output development in the developing countries through transfer of technology, improvement in competition in domestic input market, enhancement of human capital development and contribution to corporate tax revenues in the host country. Countries should therefore create a pleasant business environment as a priority for the attraction of FDI.

In examining the consequence of overseas direct investment on GDP growth in Ghana during the period 1980-2010, Antwi & Zhao (2013) employed the cointegration technique and the Vector Error Correction (VEC) model to define the magnitude of the association between foreign direct investment and GDP growth. The research found a long-term equilibrium association exists between FDI and GDP growth in Ghana during the period 1980-2010. The short-run component of the Vector Error Correction model indicate a statistically significant and positive association between external direct investment and national output growth in the state during the period 1980-2010.

Following the study by Zafar (2013) which investigated the factors influencing inward FDI in BRICS countries using high frequency data, Haydaroğlu (2016) made a further examination of influence of FDI on growth on BRICS countries, namely Brazil, Russia, India, China and South Africa over the sample period 1995-2013. The pooled ordinary least squares model, fixed effects model and random effects model panel regression techniques were employed in the study in which the appropriate method was selected using the Hausman test. Both the FE and RE models results indicate goodness of fit as remarked by the Wald Chi-Square and F-statistic respectively. The coefficient estimated show that external direct investment had a statistically significant desirable impact on national output growth in BRICS countries.

Adeleke (2014) investigated the effect of foreign direct investment on economic growth at a regional level in Africa both at aggregated and disaggregated levels. The

pooled ordinary least squares (OLS), random effects (RE) and fixed effects (FE) models were applied for estimation in the study. Estimated results from the empirical study reveal that governance in many African countries was rather weak and therefore inhibited economic growth. In respect of the effect of foreign direct investment on economic growth, results from the pooled OLS, random effects and fixed effects all indicate that FDI had a significant and desirable influence on growth in the African continent. Findings in this study conform to results also found by Casillas and Acedo (2013) and Abdoulaye, Xie & Oji-Okoro (2015).

Mahembe & Odhiambo (2013) also analysed the changing aspects of overseas direct investment in SADC nations based on evidence from five middle-income economies. The respective economies include South Africa, Botswana, Zambia, Lesotho and Swaziland. The study points out that in the 1980s and 1990s, these nations were characterised by protectionist policies, especially towards small industries from overseas competition. Resultantly, external direct investment was low throughout the period. Nonetheless, at the end of the 1990s and beginning of the 2000s, these countries embarked on new policies around privatization, liberalization and foreign direct investment regulatory review. The policies led to significant increases in foreign direct investment inflows largely from developed countries. However, foreign direct investment inflows in these countries were reported to be low due to several constraining factors, which include political insecurity, policy unpredictability and difficulties in conducting business.

In examining the influence of sector external direct investment on national output growth in emerging countries, Makwembere (2014) accentuated the importance of overseas direct investment as an instrument for stimulating national output growth. The study followed the procedure for selection of the appropriate panel estimation method between the random effects model and the fixed effects model. Grounded on the Hausman test, the random effects model was ultimately employed as the appropriate technique for estimating the impact of sector external direct investment on national output growth in developing countries. Empirical outcomes from the research found evidence that sectoral external direct investment has a significant impact on national output growth.

## Chapter 3

### Research Question and Hypothesis

#### 3.1 Introduction

This chapter provides research question and research hypothesis developed by the researcher in examining the influence of overseas direct investment (FDI) on national output growth in South Africa during the sample period 1994-2014.

#### 3.2 Research question

- What is the influence of foreign direct investment on economic growth in South Africa during the period 1994-2014?

#### 3.3 Research hypotheses

##### Null hypothesis

- Foreign direct investment has a statistically significant and positive influence on economic growth in South Africa.

##### Alternative hypothesis

- Foreign direct investment does not have a statistically significant and positive influence on economic growth in South Africa.

## Chapter 4

### Research Methodology

#### 4.1 Introduction

This chapter discusses the methodology and estimation technique applied in the study in light of the research objective and research hypothesis specified in the first chapter. The methodological procedure and estimation technique applied are explained in terms of the research design, universe, sampling, unit of analysis, measurement, specific data used for econometric estimation, VAR-based lag order selection criteria, the properties of the high frequency data (unit root tests and cointegration tests), the VAR framework of the model, the Vector Error Correction model, the VEC Granger Causality or Block Exogeneity Wald experiment, Impulse Response Functions (IRFs), and the Cholesky variance decompositions.

#### 4.2 Research design

In light of the rationale that this research aims to empirically estimate the influence of foreign direct investment on economic growth, a quantitative approach was applied in the study. Technically, a multivariate time-series econometric model was applied in the analysis. Prior high frequency properties of the data were tested before estimation of the model. Similarly, post-estimation diagnostic tests were performed to determine robustness of the model.

#### 4.3 Universe

The population dataset for this research study was annual the time series data for the South African economy. The specific macroeconomic indicators or variables used in the analysis include gross domestic product (GDP), overseas direct investment, and the terms of trade.

#### 4.4 Sampling

Time-series annual data on GDP growth (GDPg), external direct investment (FDI) and terms of trade (ToT) during the sample period 1994 to 2014 were sourced from the South African Reserve Bank (SARB) historical macroeconomic online data portal.

#### **4.5 Unit of analysis**

The Vector Error Correction (VEC) multivariate time-series econometric model was applied to estimate the endogenous effects between economic growth and foreign direct investment. The endogenous effects were captured for both the long-run and short-run time horizons, while terms of trade variable was integrated into the model as an exogenous variable.

#### **4.6 Measurement**

The measurement procedure adopted in this study followed the standard time-series econometric estimation process within which the unit root and cointegration tests were analysed prior to approximation of Vector Auto-Regressive (VAR) based VEC model.

#### **4.7 Data**

Time-series quarterly time series data on gross domestic product growth (GDP\_g), overseas direct investment (FDI) and terms of trade (ToT) for the sample period 1994 to 2014 was obtained from South African Reserve Bank (SARB) historical macroeconomic indicators database online portal. Moving forward, the time series properties of the data, which primarily include the unit root and cointegration tests of were further examined prior to empirical estimation of the results.

#### **4.8 Unit Root Tests**

Given that the actual data generation process is not known, the univariate unit root tests were conducted to establish the order of integration of the data series. The Augmented Dickey Fuller (ADF) test criterion was applied for the series in levels, as well as at first differences at intercept. The use of the ADF criterion was based on the premise that the tests perform satisfactorily even when a sample is small (Hamilton, 1994). The tests were performed to examine whether the difference between non-stationary series becomes stationary when the same variables move together in the long run, even though they may drift apart in the short run; following the specification:

$$\Delta y_i = \beta_1 + \delta y_{i-1} + \sum_{j=1}^{p-1} a_j \Delta y_{i-j} + u_i \quad \text{----- (33)}$$

where  $u_i$  represents a untainted white noise error term,  $\Delta y_{i-j} = y_{i-1} - y_{i-2}$  and  $p$  denotes the class of autoregression; the null hypothesis being  $\delta=0$ .

The ADF tests with trend variable were performed based on the function:

$$\Delta y_i = \beta_1 + \beta_2 t + \delta y_{i-1} + \sum_{j=1}^{p-1} a_j \Delta y_{i-j} + u_i \quad \text{----- (34)}$$

where  $t$  represents the time or trend variable; with the null hypothesis being  $\delta=0$ .

Stationarity tests were carried out to examine whether all variables could be integrated of order one at 5 percent level of significance based on the Augmented Dickey-Fuller (ADF) approach. The correlogram of residuals squared test was applied to test for stationarity of the model. The Box and Pierce Q statistic was applied to test for the joint hypothesis that all sample autocorrelation coefficients ( $\rho_k$ ) are simultaneously equal to zero, taking into account the practical consideration that a probability of 0.255 in obtaining a Q statistic value of 20.387 up to the optimum maximum number of lag(s) based on the VAR lag selection criterion suggests stability of the model.

#### 4.9 Vector Autoregressive (VAR) Model

Following Sims (1980), macroeconomic variables are potentially endogenous; hence they implicitly exhibit joint dynamic behaviour. In light of this background, models that explicitly demonstrate causality have great potential of being mis-specified. As an alternative, the vector autoregressive (VAR) model allows variables to interact without imposing a theoretical structure on estimates. Following Kalumbu and Sheefeni (2014), Aga (2014), Horvath and Wieringa (2016), and Abushhewa and Zarook (2016), the VAR model treats given variables as endogenous, optimally describes the dynamic behaviour of the respective economic variables, and efficiently captures both the short-term and long-term interrelationships among given variables. In light of this background, the VAR model specified in equation 4 was

applied to enhance parameter efficiency in estimation of the influence of external direct investment on output growth:

$$GDP_t = f(FDI, Z) \quad \text{----- (35)}$$

Where GDP represents gross domestic product (GDP) growth, FDI denotes foreign direct investment, while Z represents a set of macroeconomic exogenous variables that influence both GDP growth and FDI. Specifically, Z is a 1x1 matrix comprising of the Terms of Trade (ToT) exogenous variable. Following Tan (2012), Javed, Qaiser, Mushtaq, Saiullaha and Iqbal (2012), Kalumbu and Sheefeni (2014), Agar (2014), and Hussain and Haque (2014), trade, measured by changes in ToT, remains an important exogenous variable that influences economic growth, for which analysis was conducted using the (VAR)-based Vector Error Correction (VEC) model conditional upon evidence of one or more cointegration vectors among the set of given variables (Andrei & Andrei, 2015). Against the background of such empirical literature, the ToT exogenous variable was therefore integrated into the short-run component of the VEC model to examine its effects on GDP growth and FDI during the sample period 1994-2015. Rewriting equation (4) as a VAR in levels yields:

$$\left( GDP_g \right)_t = \alpha_{11} - \pi_{12} \theta_{13} (1 + \pi_{12} + \phi_{11}) \left( GDP_g \right)_{t-1} + (-\pi_{12} + \phi_{12}) (FDI)_{t-1} + \varepsilon_{11t} \quad \text{----- (36)}$$

The VAR model specified above (equation 5) allows for a dynamic relationship among variables in the estimation model. Therefore, the VAR framework was adopted to determine whether or not FDI statistically significantly affects GDP in the direction presumed by standard theory of foreign direct investment, considering terms of trade (ToT) as an exogenous macroeconomic trade policy variable.

#### 4.10 VAR Lag Order Selection Criteria

Using the VAR based lag order determination criteria, optimal lags were selected based on the LR test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC). The determination of the optimal lag length will be done in order to conduct cointegration and Granger causality tests.

#### 4.11 Cointegration Test

In circumstances where the variables will be found to have a unit root, the Johansen (1988) test was used to test for the long run relationship between variables to identify the number of cointegrating vectors. The cointegrating vectors provides an indication of the number of cointegrating equations that were estimated in the VEC model. The time-series cointegrating relationship was therefore be specified as:

$$\left(\text{GDP}_g\right)_t = \alpha + \beta(\text{FDI})_t + \mu_t \quad \text{-----} \quad (37)$$

The gross domestic product (GDP) growth model would be strongly statistically significant if and only if the I(1) processes of the respective variables are cointegrated and  $\beta=1$ . Conversely, the model is weakly statistically significant if GDP growth and FDI are cointegrated and  $0 < \beta < 1$ . If the null hypothesis of cointegration is rejected,  $\mu_t$  must be stationary. Moreover, if GDP growth and FDI are I(1) process, variables would be cointegrated, implying existence of an error correction mechanism.

#### 4.12 Vector Error Correction Model (VECM) Estimation

Denoting the gross domestic product growth and foreign direct investment by  $\text{GDP}_g$  and FDI; respectively, the estimated VEC function will be formulated as:

$$\left(\text{GDP}_g\right)_t = \beta_1 + \beta_2 \left(\text{GDP}_g\right)_{t-1} + \beta_3 \left(\text{FDI}\right)_{t-1} + \varepsilon_t \quad \text{-----} \quad (38)$$

The one period lag of the  $\text{GDP}_g$  variable was added (equation 37) to measure the speed of adjustment to the long-run equilibrium path. Given the procedure followed in estimating equations of the Vector Error Correction (VEC) model, a set of two equations was specified to estimate both short-and long-run parameters of the model:

$$\Delta\left(\text{GDP}_g\right)_t = \alpha_{11} + \pi_{12}\left[\left(\text{GDP}_g\right)_{t-1} - \theta_{12}\left(\text{FDI}\right)_{t-1} - \theta_{13}\right] + \varphi_{11}\Delta\left(\text{GDP}_g\right)_{t-1} + \varphi_{12}\Delta\left(\text{FDI}\right)_{t-1} + \varepsilon_{11t} \quad \text{-----} \quad (39)$$

$$\Delta\left(\text{FDI}\right)_t = \alpha_{21} + \pi_{13}\left[\left(\text{GDP}_g\right)_{t-1} - \theta_{12}\left(\text{FDI}\right)_{t-1} - \theta_{13}\right] + \varphi_{21}\Delta\left(\text{GDP}_g\right)_{t-1} + \varphi_{22}\Delta\left(\text{FDI}\right)_{t-1} + \varepsilon_{21t} \quad \text{-----} \quad (40)$$



Given the nature of the VEC model, empirical estimation was undertaken as a model containing two functions (39) and (40); where  $(GDP_g)_{t-1} - \theta_{12}(FDI)_{t-1} - \theta_{13}$  in (39) and (40) denote the deviation of GDP growth from the long run relationship given by:

$$(GDP_g)_{t-1} = \theta_{12}(FDI)_{t-1} + \theta_{13} \quad \text{----- (41)}$$

The parameter  $\pi_{12}$  in denotes the error correction term computed from the error correction mechanism (ECM). Accordingly, the error correction term that captures the response of GDP growth to deviations from the long-run equilibrium path was specified in equation (42). Subsequently, the VECM approach further estimated the GDP growth function given by (38) as a model containing (39) and (40); yielding:

$$\Delta Z_t = \varpi Z_{t-1} + \sum_{i=1}^k \xi_i \Delta Z_{t-1} + c_t + \varepsilon_{kt} \quad \text{----- (42)}$$

where:

$Z_t$  denotes a 3x1 vector containing I(1) endogenous variables (GDP growth, FDI and a constant),

$\xi_i$  represents the 2 x 2 short-run coefficient matrices,

$C_t$  is a vector containing constants, and

$\varepsilon_{kt}$  denotes IDD error terms.

The parameter  $\varpi$  was further decomposed into  $\tau$  and  $\vartheta'$  matrices; yielding:

$$\varpi Z_{t-1} = \tau \vartheta' Z_{t-1} = \begin{bmatrix} \tau_{11} \\ \tau_{12} \end{bmatrix} \begin{bmatrix} 1 - \vartheta_{12} - \vartheta_{13} \\ 1 \end{bmatrix} \begin{bmatrix} (GDP_g)_{t-1} \\ (FDI)_{t-1} \\ 1 \end{bmatrix} \quad \text{----- (43)}$$

where:  $\tau$  denotes a 2 x 1 matrix of two variables with at least 1 cointegrating relationship that contains the long-run equilibrium adjustment parameter; and  $\vartheta'$  represents a 1x3 matrix containing long run parameters, including a constant.

To simultaneously capture the short- and long run dynamics, the GDP growth equation was estimated within the joint framework of a general finite autoregressive distributed lag (ARDL) model and the parsimonious error correction mechanism (ECM). The ECM ensures that the conventional long run relationship of the primary explained variable (GDP growth) with its regressors holds in a steady state and also immediately provides the speed of adjustment to long run equilibrium.

#### 4.13 VEC Granger Causality or Block Exogeneity Wald Test

To determine the short run causality between GDP growth and FDI, the Granger causality/Block Exogeneity Wald test based upon the VEC model was performed. Based on the null hypothesis that the lags of a given variable can be eliminated from a given equation in the model, the check was performed to detect if lags of one variable Granger cause another variable. Rejection of null hypothesis would imply existence of Granger causality of one variable to another. The functional form of the Granger causality/Block Exogeneity Wald test statistic was specified as:

$$(X - 3q - 1)(\log|\Sigma_{ab}| - \log|\Sigma_{mn}|) \sim \chi^2(2p) \quad \text{----- (44)}$$

where X denotes observations,

$\Sigma_{mn}$  represents the variance or covariance conditions of unobstructed VAR structure,  $\Sigma_{ab}$  denotes the variance or covariance conditions of the constrained system, and q represents the figure of lags of the variable that was eliminated from the structure.

#### 4.14 Impulse Response Function (IRF)

Since the VEC Granger causality/Block Exogeneity Wald test does not provide information on the direction of effect of one (X) variable on the other (Y) variable; as well as the time horizon it takes the variable Y to return to the long run equilibrium path due to a shock in variable X, the impulse response function analysis was performed. Accordingly, the impulse response functions were conducted to analyse the impacts of shocks on the adjustment path of endogenous variables in the dynamic system. The impulse response function were performed; specified as:

$$IR(a, b, X_{t-1}) = G(y_{t+m} | e_t = a, X_{t-1}) - G(y_{t+m} | e_t = X_{t-1}) \quad \text{----- (45)}$$

where: a symbolizes time, b ( $b_1, \dots, b_m$ ) is n x 1 vector that represents the size of shock,  $X_{t-1}$  denotes accumulative information about the economy from the past period up to time period t-1.

In light of the important role played by h in the associations of the attributes of the impulse response function (IRF), the orthogonalized impulse response (OIR) was established by classifying the shock “a” through using the Cholesky decomposition of

$\Sigma_e = H H'$ ; where  $H$  represents the  $n \times n$  minor triangular matrix. Borrowing from Sim (1980), the orthogonalized impulse response functions will be defined as:

$$IR_{ij}^0(m) = Q_m P \varepsilon_j \quad ; m = 0, 1, 2, \dots, k \quad \text{----- (46)}$$

$$: Q_m = A_1 Q_{m-1} + A_2 Q_{m-2} + \dots + A_p Q_{m-p}; Q_0 = I_n$$

where  $\varepsilon_j$  in (18) denotes  $n \times 1$  vector in which the  $j^{\text{th}}$  is unity and other elements are zeros.

#### 4.15 Cholesky variance decomposition

In order to understand the relative significance of the random error terms to endogenous variables in the estimated model, the Cholesky variance decomposition was performed in which the variance of the forecast error for each variable in the model was broken down into components. Each variable was explained as a linear combination of its own current innovations and lagged innovations of all other variables in the system. Accordingly, the variance decompositions were derived from the orthogonalized impulse response function specified in (46).

#### 4.16 Limitations

The primary limitation of this research study was that the sample period spanning from 1994 to 2014 to capture the effectiveness of the post-apartheid macroeconomic policy regime was statistically considered as a small sample size. In light of this background, the results derived from the estimation might not be sufficient to make generalizations about the influence of foreign direct investment (FDI) on gross national output growth in South Africa in the long-term period.

#### 4.17 Conclusion

This chapter discussed the methodology and estimation technique applied in the study. The methodological procedure and econometric estimation method employed were explained in terms of the research design, universe, sampling, unit of analysis, measurement, specific data used for econometric estimation, VAR-based lag order selection criteria, the time-series properties of the data (unit root tests and cointegration tests), the VAR framework of the model, the Vector Error Correction

model, the VEC Granger Causality or Block Exogeneity Wald experiment, Impulse Response Functions (IRFs), and the Cholesky variance decompositions.

Annual time-series data for the period 1994-2014 obtained the South African Reserve Bank (SARB) historical macroeconomic time-series database online portal was used for estimation in the study. Subsequent to testing of the time-series properties (unit root and cointegration tests), the Vector Error Correction (VEC) model multivariate technique was applied for estimation of empirical results using either EViews econometric modelling software. Results from the econometric estimation were expected to provide insights which government and central bank macroeconomic policy experts can use in formulating policies that can create an environment conducive for sustainably attracting foreign direct investment into the country. The next chapter presents and analyses the results obtained from econometric modelling.

## Chapter 5

### Results

#### 5.1 Introduction

This chapter present outcomes from the empirical econometric estimations performed. The results presented are on summary statistics, optimum lag(s) selected, unit root tests, cointegration test, VEC estimates, Granger causality/Block Exogeneity tests, post-estimation diagnostic tests (serial correlation, normality, and heteroskedasticity), impulse response functions, variance decomposition, and the VEC model stability test.

#### 5.2 Summary statistics for the variables

**Table 5.1: Descriptive statistics**

	Log(GDP growth)	Log(FDI)
Mean	1.092118	12.47323
Median	1.147276	12.18322
Max	1.722767	14.34088
Min	-0.693147	11.12281
S.D.	0.533161	0.934771
SW	-1.836783	0.564055
KS	7.395119	2.281341
J.B	27.34346	1.490919
Prob	0.000001	0.474516
Sum	21.84237	249.4646
Sum Sq. Dev.	5.400949	16.60213
Observations	20	20

As shown by Table 5.1, arithmetic means for GDP growth and FDI were 1.1 percent and R12.4 billion; respectively during the period 1994-2014. The corresponding standard deviations were 0.5 percent for GDP growth and 0.93 billion for FDI during the respective sample period under review. The minimum GDP growth rate was -0.6 percent while the maximum GDP growth rate was 1.7percent. Similarly, the minimum FDI was R11.1 billion while the maximum FDI was 14.3 billion.

#### 5.3 Vector Autoregression (VAR) Lag Order Selection Criteria

Prior to determining the optimal number of lags to be selected, estimation of the VAR framework for GDP growth and FDI variables was first performed, with results presented in Appendix 1. Subsequent to econometric estimation of the VAR model,

the VAR-based Lag Order Selection Criteria was used to determine the maximum number of lags applied during the econometric estimation process (Table 5.2).

**Table 5.2: VAR Lag Order Selection Criteria**

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Endogenous variables: log(GDP growth) log(FDI)  
Exogenous variables: dlog(TOT(-1))  
Included observations: 14

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Lag	LogL	LR	FPE	AIC	SC	HQ
0	-65.75053	NA	54.78303	9.678647	9.769941	9.670196
1	-5.209245	95.13631*	0.017233*	1.601321*	1.875202*	1.575968*
2	-3.226915	2.548711	0.024226	1.889559	2.346029	1.847305
3	-0.039035	3.187880	0.031025	2.005576	2.644634	1.946420

---

\* 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

---

Based the results presented in Table 5.2 above, Likelihood Ratio (LR) test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC), 1 lag was the optimal lag length selected at 5 percent level of significance. Therefore, the maximum lag length equal to 1 was used for all variables (GDP growth and FDI) in all equations of the model. The equations in which the selected optimal lag length was applied include stationarity tests, cointegration test, VEC model, diagnostic tests (eg- serial correlation, heteroskedasticity, normality and) impulse response functions and variance decomposition.

#### 5.4 Stationarity tests

The results on the univariate stationarity tests presented in Table 5.3 were computed using the Augmented Dickey Fuller (ADF) criterion. The respective tests were performed to determine the order of integration of each variable (GDP growth and FDI), and further determine the appropriateness of testing whether or not the economic variables (GDP growth and FDI) jointly had a long-run relationship.

**Table 5.3: Unit Root Tests<sup>‡</sup>**

Data Series	Lag Length	Critical Values		t-statistic	Prob. <sup>†</sup>
		$\alpha = 1\%$	$\alpha = 5\%$		
log(GDP growth)	0	-3.8573	--3.0404	-2.6903	0.0949
d(log(GDP growth))	1	-4.0044	-3.0989	-4.1387*	0.0079
log(FDI)	0	-3.8085	-3.0207	0.9335	0.9938
d(log(FDI))	0	-3.8315	-3.030	-3.5224**	0.0189
log(ToT)	1	-3.8085	-3.0207	-0.4204	0.8877
d(log(ToT))	1	-3.8574	-3.0404	-7.0190*	0.0000

<sup>†</sup>denotes MacKinnon (1996) one sided p-values

\*(\*\*) represent significance at 1 percent and (5) percent levels; respectively

The selection of proper lag length of the ADF unit root tests was determined automatically by EViews program based on the Akaike Information Criterion

<sup>‡</sup> The detailed computed unit root test results, graphs and statistics are provided in Appendices

Based on results presented in Table 5.3, all the endogenous variables (GDP growth and FDI), as well as the exogenous variable Terms of Trade (ToT), contained a unit root at level, which implies that each of the variables was not stationary at level. Results show that GDP growth series at first difference was I (1) at 1 percent significance level, while FDI series at first difference was stationary at 5 percent level of significance. Similarly, the ToT series at first difference was stationary at 1 percent significance level. The unit root tests graphs and statistics are provided in Appendices.

### 5.5 Cointegration Test Statistics

The determination of cointegrating relationships between the endogenous series GDP growth and FDI; factoring in the exogenous series Terms of Trade (ToT), was performed using the Johansen Trace and Max-Eigen statistics approach (Table 5.4).

**Table 5.4: Cointegration Test Results-No Deterministic Trend, Lag Interval: 1 to 1<sup>‡</sup>**

$H_0$	$r = 0$	$r \leq 1$
$H_1$	$r = 1$	$r = 2$
Trace statistic	13.15862*	3.526473
Critical value	12.32090	4.129906
Prob.**	0.0361	0.0716
Max-Eigen statistic	9.632150	3.526473
Critical value	11.22480	4.129906
Prob.**	0.0941	0.0716

\*Denotes rejection of the null hypothesis at 5% significance level

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

<sup>‡</sup> The detailed results on the cointegration test are provided in the Appendices section

The Trace statistic indicates existence of 1 cointegrating equation at 5 percent level of significance; hence the null hypothesis that  $r=0$  was rejected at 5 percent

significance level. Nonetheless, the Maximum Eigenvalue statistic suggests that there was no cointegration between GDP growth and FDI. Therefore, based on results of the Trace statistic, the indication that there was cointegration between GDP growth and FDI suggests that the series was suitable for econometric estimation of their dynamic inter-relationships using the VEC model.

## 5.6 VECM Results

**Table 5.5: VEC Model Estimates**

Cointegrating Equation:	CointEq1	
log(GDP growth(-1))	1.000000	
log(FDI(-1))	-0.048336 (0.02371) [-2.03898]	
Error Correction:	d(log(GDP growth))	d(log(FDI))
Coint Eq1	-0.624233 (0.31270) [-1.99625]	0.141414 (0.08560) [ 1.65211]
d(log(GDP growth(-1)))	0.089717 (0.30244) [ 0.29665]	-0.170711 (0.08279) [-2.06209]
d(log(FDI(-1)))	0.844889 (0.74514) [ 1.13387]	0.471964 (0.20397) [ 2.31394]
d(log(ToT(-1)))	4.071735 (5.46296) [ 0.74533]	-1.200218 (1.49537) [-0.80262]
R <sup>2</sup>	0.308947	0.100133
Adj. R <sup>2</sup>	0.136184	-0.124834
Sum <sup>2</sup> resids	4.827008	0.361676
Std. Err.	0.634232	0.173608
F-statistic	1.788272	0.445102
Log likelihood	-13.11612	7.613754
AIC	2.139515	-0.451719
SIC	2.332662	-0.258572
Mean dep	-0.043261	0.153093
S.D. dep	0.682398	0.163691
Determinant resid covariance (dof adj.)		0.012122
Determinant resid covariance		0.006818
Log likelihood		-5.501062
Akaike information criterion		1.937633
Schwarz criterion		2.420501

() and [] represent standard errors and t-statistics; respectively



The computed estimates of the long run section of the cointegrating equation reveal that for every 1 percent increase in foreign direct investment (FDI), there was a statistically significant corresponding increase in gross domestic product (GDP) growth by approximately 0.05 percent during the period 1994-2014. The negative sign in the facade of the computed figure of the long-run section of the cointegrating equation illustrates a positive association between the variable to which the computed figure relates and the factor on which the vector was standardized (Hussain and Haque (2016) and Dhungel (2014)). In conformity to the study Mazenda (2014) which reported the GDP growth speed of adjustment of about 29 percent in South Africa, results for the error correction component of the GDP growth equation in this study reveal that about 62 percent of the deviance from the long-run equilibrium trajectory was rectified in the first year following occurrence of the deviance during the period 1994-2014. The respective result further conforms to the finding by Hussain and Haque (2016) which reported evidence of approximately 52 percent GDP promptness of correction to the long –term equilibrium in Bangladesh during the sample period 1973-2014. The computed t-statistics for both the error correction and cointegration equations were statistically significant at 5% level.

Though statistically insignificant, the positive impact of terms of trade (ToT) on GDP growth in the short run demonstrates that GDP growth marginally reacted to movements in the country's trade integration as measured by terms of trade. The result suggests that for every 1 percentage point increase in the lagged terms of trade index, there was a parallel marginal increase in GDP growth by about 4 percentage points. Nonetheless, though the result shows evidence that lagged terms of trade (economy's integration into global trade), may FDI, the influence was statistically insignificant. However, terms of trade had a statistically insignificant impact on FDI during the sample period 1994-2014. The result conforms to Kalumbu and Sheefeni (2014) who found that terms of trade had a negative impact on FDI and growth in Namibia during the period 1980 to 2012. Moreover, Hussain and Haque (2016) found that trade had an insignificant effect on FDI and growth in Bangladesh over the period 1973-2014. The F-statistic ( $p > 0.05$ ) reveals that the null hypothesis that all slope coefficients are jointly equal to zero. To determine the short-

run causality between GDP growth and FDI, the VEC Granger causality/Block Exogeneity tests were performed, with results presented in Table 5.7 below.

**Table 5.6: VEC Granger Causality or Block Exogeneity Wald Tests**

Panel A – Dep variable: d(log(GDP growth))			
Excluded	Chi-square	df	Prob.
d(log(FDI))	1.285659	1	0.2568
All	1.285659	1	0.2568
Panel B – Dep variable: d(log(FDI))			
Excluded	Chi-square	df	Prob.
d(log(GDP growth))	4.252200	1	0.0392
All	4.252200	1	0.0392

‡ The detailed results on the cointegration test are provided in Appendices

The results (Table 5.7) on the joint test p-values for the respective equations of GDP growth and FDI show that the respective variables were exogenous in nature during the period under review. Based on Panel A, the null hypothesis that FDI does not Granger GDP growth could not be rejected based on the insignificant Chi-square statistic ( $p > 0.05$ ) at 5 percent significance level, hence FDI does not Granger cause GDP growth. This result conforms to the finding by Aga (2014) which revealed that FDI does not Granger-cause GDP growth in Turkey during the period 1980-2014. The result therefore implies that the lagged difference of the FDI variable could be excluded in the differenced GDP growth equation. However, Panel B results indicate that the null hypothesis that GDP growth does not Granger cause FDI ratio was rejected at 5 percent level of significance, implying that GDP growth Granger-caused FDI during the sample period 1994-2014.

In line with the finding that GDP weakly Granger-caused FDI in a panel of developing countries reported by Mahmoodi and Mahmoodi (2014), the results in this study which revealed that GDP Granger-caused FDI therefore implies that the lagged difference of GDP growth equation could not be excluded in the differenced FDI equation. Overall, results suggest no evidence of causality from FDI to GDP growth at 5% significance level, while there was proof of one way causality from GDP growth to FDI during the period under review. Although the above-explained results were reported no information was provided on the impact of one-standard deviation innovation of one variable on itself and another variable. To derive such evidence,

impulse response function and variance decompositions were performed, and the computed results are presented in section 5.7.

### 5.7 Diagnostic Tests of the VECM Residual

The estimated VEC model residual diagnostic tests were examined to determine the robustness of the model are in Table 5.7.

**Table 5.7: VEC Model Residual Tests<sup>†‡</sup>**

Residual Test	Measurement	Chi-square	df	Prob.
Serial LM Test	LM-Stat	3.925294	4	0.4162
Normality Test	Jacque-Bera	2.385657	4	0.6652
Heteroskedasticity	No Cross Terms	22.59773	24	0.5436

<sup>†</sup> indicates that results reported are for the joint tests

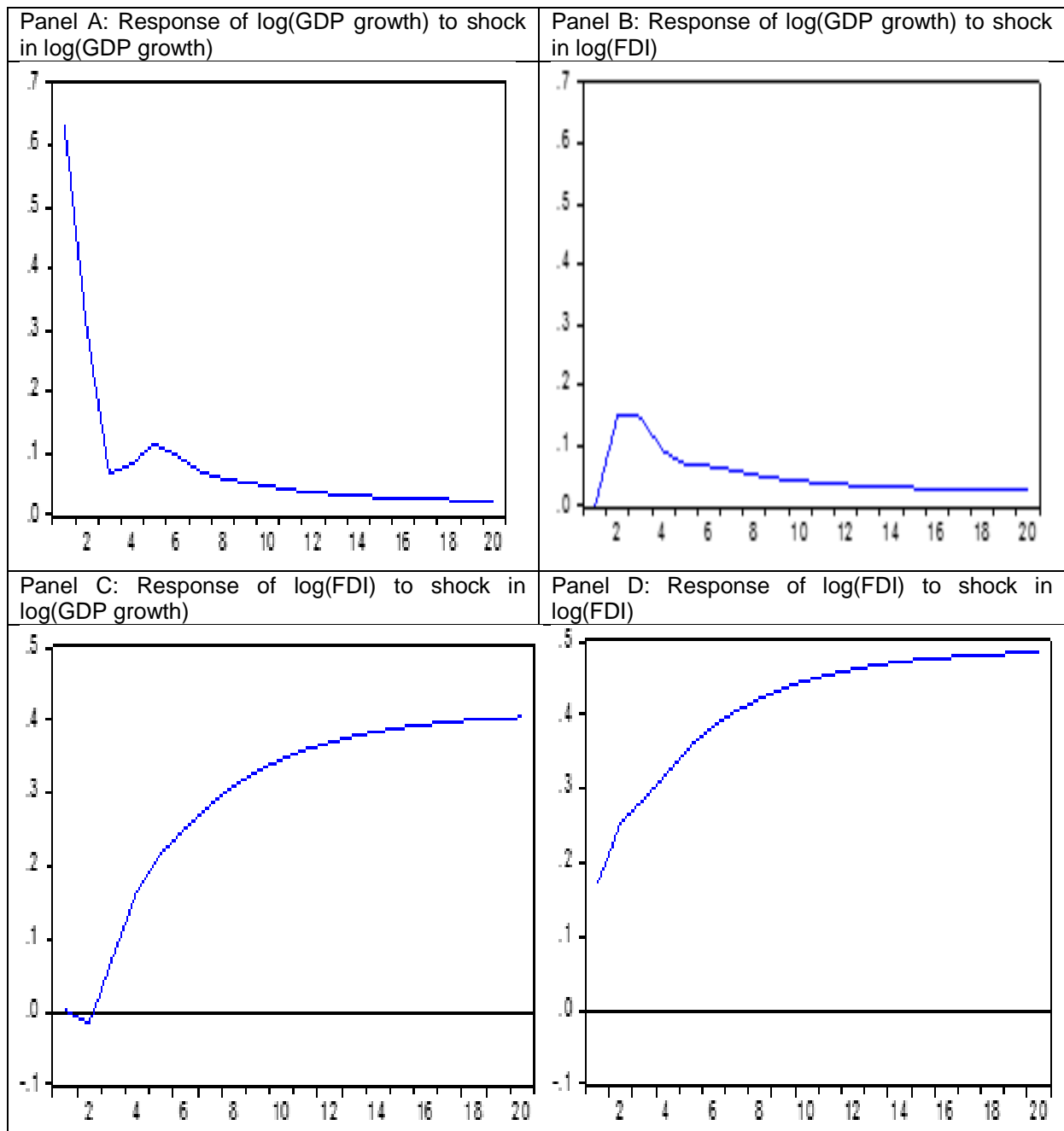
<sup>‡</sup> The detailed results and graphs on the residual diagnostic tests are provided in Appendices

The estimated VEC model passed all the residual diagnostic tests. The diagrams on the residual tests, and correlograms are presented in Appendices. The correlograms show that there potentially was no material autocorrelation left behind in the residuals.

### 5.8. Impulse Response Function

The impulse response functions computed from the estimated VEC model were derived using orthogonalized Cholesky decomposition, and results are presented in Figure 5.1.

**Figure 5.1: Response to a One Standard Deviation over a 21 year (1994-2014) Period**



Source: Author's Computations from EViews program

The impulse response function in Panel A reveals that the shock to GDP growth had a significant favourable impact on GDP growth throughout the entire sample time frame 1994-2014. The impact however drastically reduced between the 1<sup>st</sup> year and the 3<sup>rd</sup> year after the shock, and marginally improved between the 3<sup>rd</sup> year and the 5<sup>th</sup> year. Though remaining statistically significant, the shock steadily declined from the 5<sup>th</sup> year and remained relatively stable the 8<sup>th</sup> year and the 20<sup>th</sup> year during the sample period under review. Panel B shows that an innovation in FDI had a

favourable influence on future GDP growth after the first year. Though the magnitude of the impact steadily reduced from the 3<sup>rd</sup> year, the innovation remained stable and statistically significant and favourable from the 4<sup>th</sup> year throughout to the 20<sup>th</sup> year. Panel C results provide evidence that a shock emanating from GDP growth to FDI had a statistically significant and favourable impact on future FDI from the 2<sup>nd</sup> year through to the 20<sup>th</sup> year. Similarly, the impact of a one standard deviation innovation to FDI on FDI was favourable and statistically significant throughout the sample period. Analysis of the impact of an exogenous shock to one variable directly on itself and another variable was performed on the short-to-long term (21 year) horizon based on the orthodox postulation that the economy returns to the equilibrium path in the long run.

### **5.9 Variance decompositions**

Tables with results on variance decomposition in the VECM are reported in Appendix 7. The results in Panel A (Table 5.9) show that fluctuations in the GDP growth were explained mainly by shocks to GDP growth in the long run. GDP growth shock accounted for 100% variation in the 1<sup>st</sup> year, while the proportion in variance of GDP growth marginally decreased as time progressed and reached 87.2% in the 20<sup>th</sup> year. The role played by the shock to FDI on variance of GDP growth marginally increased over time from 0% in the first year to 12.8% in the 20<sup>th</sup> year. Similarly, results presented in Panel B (Table 5.9) show that the fluctuations in FDI were explained mainly by shocks to FDI itself. GDP growth shocks accounted for approximately 0% variance in FDI and marginally increased to approximately 36.8% in the 20<sup>th</sup> year.

### **5.10 VEC Model Estimates Stability Test**

Table 5.10 showing results of stability condition of the VEC model estimates is presented in Appendix 8. The results indicate that all roots have modulus less than one and generally lie inside the unit circle (Inverse Roots of AR Characteristics Polynomial diagram presented in Appendix). The presence of 1 unit root satisfies the condition that when a VEC model has been estimated from a single cointegrating relation with two variables, then the characteristic polynomial should have 1 root equal to unity. The empirical results of the VECM estimation therefore satisfied the stability condition.

### **5.11 Conclusion**

This chapter presented empirical results on the influence of FDI on GDP growth in South Africa during the sample period 1994-2014. A VAR framework-based Vector Error Correction Model (VECM) was used to examine whether or not FDI had a statistically significant and favourable influence on FDI in light of the research hypothesis. Empirical results derived indicate that FDI had a statistically significant and favourable influence on economic growth in South Africa in the long-run based on data for the sample period 1994-2014. The impulse response functions indicate that the shock to GDP growth demonstrated a significant favourable impact on national output growth throughout the entire sample period 1994-2014. The impact nonetheless radically reduced between the 1st year and the 3rd year after the shock, and marginally improved between the 3rd year and the 5th year. Results further show that a shock or innovation in FDI had a favourable influence on future GDP growth after the first year. Though the magnitude of the impact steadily reduced from the 3rd year, the innovation remained stable and statistically significant and positive from the 4th year throughout to the 20th year. Moreover, results provide evidence that a shock emanating from GDP growth to FDI had a statistically significant and positive impact on future FDI from the 2nd year through to the 20th year. The variance decompositions results show that the variance in GDP growth was largely accounted for by GDP growth, while the variance in FDI was similarly largely accounted for by FDI itself.

## Chapter 6

### Discussion of Results

#### 6.1 Introduction

This chapter provides a discussion of results obtained from econometric estimations conducted in line with the research objective, research question and research hypothesis of the study. The results are discussed in line with relevant empirical literature reviewed regarding the influence of FDI on GDP growth of the country.

#### 6.2 Results objective, Research question and Research hypothesis

##### 6.2.1 Research objective

- To examine the influence of foreign direct investment on economic growth in South Africa during the period 1994-2014.

##### 6.2.2 Research question

- What is the influence of foreign direct investment on economic growth in South Africa during the period 1994-2014?

##### 6.2.3 Research hypothesis

- Foreign direct investment has a statistically significant and positive influence on economic growth in South Africa.

#### 6.3 Results discussion

Following the standard procedure in econometric modelling of time-series data using the Vector Autoregressive (VAR) and Vector Error Correction (VEC) models, the VAR lag order selection criteria was used to determine the maximum number of lags applied during the econometric estimation process. Based on the criterion, the results provided by the Likelihood Ratio (LR) test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC) and Hannan-Quinn Information Criterion (HQIC) show that lag 1 was the optimal lag length selected at 5 percent level of significance. Thus, the maximum lag length equal to 1 was used for variables (GDP growth and FDI) in all equations of the model.

Furthermore, the results on the univariate unit root tests presented performed on the Augmented Dickey Fuller (ADF) criterion on the endogenous variables (GDP growth and FDI), as well as the exogenous variable Terms of Trade (ToT) rejected the null hypothesis that the variables contained a unit root at level, which implies that each of the variables was not stationary at level. For the endogenous variable GDP growth, and the exogenous variable terms of trade, the null hypothesis of unit root was rejected at 1% level of significance, while for the endogenous variables FDI, the null hypothesis of unit root was rejected at 5% significance level. Therefore, GDP growth and terms of trade integrated of order 1  $I(1)$  at 1% level of significance, while the FDI series was also integrated of order 1  $I(1)$  at 5% significance level, indicating that cointegration test could be conducted to test whether the variables had a long-run relationship.

The results of the Trace statistic of the Johansen cointegration test performed between the endogenous variables GDP growth and FDI revealed existence of 1 cointegrating equation at 5 percent level of significance. Therefore, the null hypothesis that there was zero cointegrating relationship between the respective endogenous variables was rejected. The results confirming cointegration between GDP growth and FDI suggests that the variables were suitable for estimation of their relationship using VEC model. Subsequent to cointegration test, the Vector Error Correction (VEC) model estimates were produced using EViews econometric software program. Estimated results on the long-run section of the cointegrating equation designate that following every 1% rise in foreign direct investment (FDI), there was a statistically significant and positive increase in GDP growth by about 0.05% during the sample period 1994-2014. The favourable association between the variable to which the computed coefficient relates and the factor on which the vector was standardised in the estimated model.

Moreover, results for the error correction (EC) component of the GDP growth equation divulge that about 62% of the deviance from the long-run stability pathway was rectified in the first year after the deviance occurred during the sample period 1994-2014. The occurrence of the steady modification to the long term equilibrium through the short term partial adjustment mechanism was confirmed by the estimated GDP growth response to deviances from the long term equilibrium path



equal to -0.62. The computed t-statistics for both the error correction and cointegration equations were statistically significant. Results in this study confirm to findings from the study conducted by Adhikary (2015) in which the dynamic effects of FDI on economic growth rate in Nepal were examined. Adhikary (2015) applied the vector error correction (VEC) model to determine whether or not there was a long-run relationship between FDI and national output growth using annual data for the sample period 1985-2012. Estimates from the VEC model show evidence that FDI had a statistically substantial favourable effect on national output growth in Nepal during the period 185-2012.

Similarly, the results confirm to Gudaro, Chhapra & Sheikh (2012) who analysed the impact of FDI on GDP growth in Pakistan during the period 1981-2010. Based on multiple regression model, results reveal a significant and positive association between FDI and growth in GDP. The study further concludes that FDI is an essential instrument for economic growth in the developing countries through transfer of technology, improvement in competition in domestic market, improvement of human capital and contribution to corporate tax revenues in the host country. The results reported by Antwi and Zhao (2013) in their empirical study on economic growth in Ghana during the period 1980-2010 are also in line with the results found in this study. Based on the results from the Vector Error Correction (VEC) model which estimated the magnitude of the relationship between FDI and economic growth, Antwi and Zhao (2013) found a long-term and causal relationship between the external direct investment and national output growth in Ghana during the period 1980-2010. The short-run component of the VEC model indicate a statistically significant and positive relationship between FDI and national output growth in the country during the period under review.

Furthermore, the results showing statistically significant and positive effect of FDI on GDP growth are also consistent with the results found by Zafar (2013). Based on the cross-sectional time series study conducted by Zafar (2013), the effect of FDI on economic growth on BRICS countries, namely Brazil, Russia, India, China and South Africa over the sample period 1995-2013 was examined. The pooled OLS, fixed effects (FE) and random effects (RE) panel regression models were employed in the study in which the appropriate method was selected using the Hausman test

technique. Results from both the FE and RE models indicate that FDI has a statistically significant and positive effect on economic growth.

In light of the short-run standpoint, results on the causality between GDP growth and FDI produced using the VEC model-based Granger causality/Block Exogeneity test show evidence that FDI does not Granger cause gross domestic product (GDP) growth at 5% significance level. The result implies that the lagged difference of the FDI variable could be excluded in the differenced GDP growth equation. This result in this study contradicts the results reported by Adhikary (2015) whose study which used Granger-Causality test found that FDI had a statistically significant positive effect on economic growth in Nepal during the period 1985-2012.

Results of this study show that the null hypothesis of the study which stated that national output growth does not Granger cause FDI ratio could not be rejected at 5% significance level, implying that GDP growth indeed Granger-caused FDI in South Africa during the sample period 1994-2014. Overall, results suggest no evidence of one way causality from FDI to GDP growth at 5% significance level, while there was indication of one way causality from GDP growth to FDI during the period under review. The VEC model post-estimation tests performed based on serial Lagrangian Multiplier (LM) test, normality test and heteroskedasticity test show that the model passed all critical tests.

The impulse response functions results on the impact of one-standard deviation innovation of external direct investment on national output growth and vice versa performed using orthogonalized Cholesky decomposition show that a shock or innovation in overseas direct investment had a favourable influence on future national output growth after the first year. The magnitude of the impact steadily reduced from the 3<sup>rd</sup> year and remained stable and statistically significant and positive from the 4<sup>th</sup> year throughout to the 20<sup>th</sup> year. From the other side, a shock from GDP growth to FDI also had a statistically substantial and favourable impact on future FDI from the 2<sup>nd</sup> year through to the 20<sup>th</sup> year.

The variance decomposition results show that fluctuations in the GDP growth were explained mainly by shocks to GDP growth in the long run. Empirical estimates

reveal that GDP growth shock accounted for 100% variation in GDP growth in the 1<sup>st</sup> year, while its percentage in the variance of GDP growth marginally decreased over time and reached 87.2% in the 20<sup>th</sup> year. From the other side, the role played by the shock to FDI on variance of GDP growth marginally improved over time from 0% in the 1<sup>st</sup> year to 12.8% in the 20<sup>th</sup> year. Similarly, fluctuations in FDI were largely explained by shocks to FDI itself, while shocks to GDP growth accounted for about 0% variance in FDI during the 1<sup>st</sup> year and marginally increased to about 36.8% in the 20<sup>th</sup> year.

#### **6.4 Conclusion**

This chapter discussed the primary results found in this study in line with empirical literature on the influence of foreign direct investment on economic growth. The results discussed were estimated using data for the South African economy during the sample period 1994-2014. A VAR-based Vector Error Correction (VEC) model was applied to examine whether or not FDI had a statistically substantial and favourable influence on FDI in light of the research question and research hypothesis. Empirical results derived indicate that FDI had a statistically significant and positive influence on economic growth in South Africa during the sample period 1994-2014. Therefore, the research hypothesis that FDI has a statistically considerable and favourable impact of economic growth could not be rejected. Overall, the reported results that FDI has statistically substantial and positive impacts in the long term and short term components of the VEC model confirm to findings from similar past empirical studies.

## Chapter 7

### Conclusion

#### 7.1 Introduction

This chapter provides the conclusion and recommendations to the research study in line with the research objective, research question and research hypothesis. The recommendations are provided to government policy makers in terms of the policy implications of the results, the academic researchers and the implications for future or further studies.

#### 7.2 Principal findings

This research study scrutinized the influence of overseas direct investment (FDI) on national output growth in South Africa during the period 1994-2014. The rationale for the study was anchored on the 2015 United Nations World Investment Report released at the United Nations Conference on Trade and Development which highlights that foreign direct investment flows into South Africa plunged by 31.2% to \$5.8 billion in 2014 down from \$8.3-billion in 2013 (UNCTAD, 2015). In that respect, the South African economy's growth was predicted to remain sluggish over the coming years from 2015, which was further regarded as an inflammatory shock that would lead the country to facing the risk of daunting challenges in competing with other emerging economies for foreign direct investment (HDR, 2012).

The research collected and used annual time-series data which covered the time span 1994-2014 sourced from the South African Reserve Bank (SARB) historical macroeconomic statistics online database. Following testing of the time-series properties using the ADF test and Johansen cointegration test, the Vector Error Correction (VEC) model multivariate technique was applied for estimation of empirical results using EViews econometric modelling software. Results of the Trace statistic of the Johansen cointegration test performed between the endogenous variables GDP growth and FDI revealed existence of long-run relationship between the respective variables. Empirical results derived about the effect of FDI on economic growth in South Africa during the sample period 1994-2014, lead to non-

rejection of the null hypothesis that FDI has a statistically significant and positive impact of economic growth in the South African economy.

### **7.3 Implications for government policy makers**

Given the triple challenge of poverty, unemployment and income inequalities the South African economy has been experiencing since attainment of democracy in 1994, it is important that formulation and implementation of policies that attract significant inflows of foreign investment be given serious consideration. The government need to ensure that the dimensions of good governance which include voice and accountability, rule of law, control of corruption, regulatory quality, government effectiveness, and political stability be improved together with the macroeconomic policy framework to attract increased foreign direct investment into the economy.

Following the results from this study, increases in foreign direct investment will lead to significant economic growth in the country. Through the multiplier effect, improvement in economic growth will lead to labour absorption (job creation), and reduction in poverty levels. In order to reduce income disparities, the government should engage in inclusive dialogues with different stakeholders which include the labour, social protection, civil society and macroeconomic sectors (fiscal and monetary sectors) in designing and adoption of policies which reduce the currently existing wide income disparities in the economy. The government should ensure and maintain fiscal discipline in order to avoid crowding out effect, while monetary authorities should monitor the exchange rate and maintain stable interest rates in the economy to ensure sustainable attraction of significant inflows of foreign direct investment.

### **7.4 Implications for academic researchers**

This research study significantly contributes to the existing literature on the influence of foreign direct investment on economic growth in South Africa. Given that the bulk of studies on the respective area were conducted in developed economies, consistent studies in respect of South Africa and other emerging or developing economies should be undertaken as well to understand whether FDI remains significant in stimulating economic growth over different time horizons.

## **7.5 Suggestions for future research**

The primary limitation of this research was that the annual data for the sample period 1994-2014 used to examine the influence of the post-apartheid macroeconomic policy regime can be considered as a statistically small sample size. In light of this background, the results derived from the estimation could not be used to make reliable generalizations about the influence of external direct investment on national output growth in South Africa. The relatively larger sample size should therefore be used to improve precision of the estimates. Furthermore, more relevant independent variables that economic growth should also be incorporated into the model to minimize the risk of model mis-specification and derive parsimonious econometric estimates.

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## Appendices

### Appendix 1: Vector Autoregression (VAR) Estimates

	LOG(GDP_GROWTH)	LOG(FDI_ASSETS_SARB_)
LOG(GDP_GROWTH(-1))	0.277931 (0.27771) [ 1.00079]	-0.089794 (0.07979) [-1.12537]
LOG(FDI_ASSETS_SARB_(-1))	0.056804 (0.02602) [ 2.18270]	1.020936 (0.00748) [ 136.538]
DLOG(TOT(-1))	3.516780 (4.38735) [ 0.80157]	0.470250 (1.26055) [ 0.37305]
R <sup>2</sup>	0.126061	0.969560
Adj. R <sup>2</sup>	0.001213	0.965211
Sum <sup>2</sup> . resids	4.713603	0.389105
S.E. eqn	0.580246	0.166713
F-statistic	1.009714	222.9596
Log likelihood	-13.21849	7.983551
AIC	1.908057	-0.586300
SIC	2.055095	-0.439262
Mean dep	1.085247	12.57471
S.D. dep	0.580599	0.893821
Determinant resid covariance (dof adj.)		0.009134
Determinant resid covariance		0.006195
Log likelihood		-5.029630
Akaike information criterion		1.297603
Schwarz criterion		1.591679

## Appendix 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-65.75053	NA	54.78303	9.678647	9.769941	9.670196
1	-5.209245	95.13631*	0.017233*	1.601321*	1.875202*	1.575968*
2	-3.226915	2.548711	0.024226	1.889559	2.346029	1.847305
3	-0.039035	3.187880	0.031025	2.005576	2.644634	1.946420

\* 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

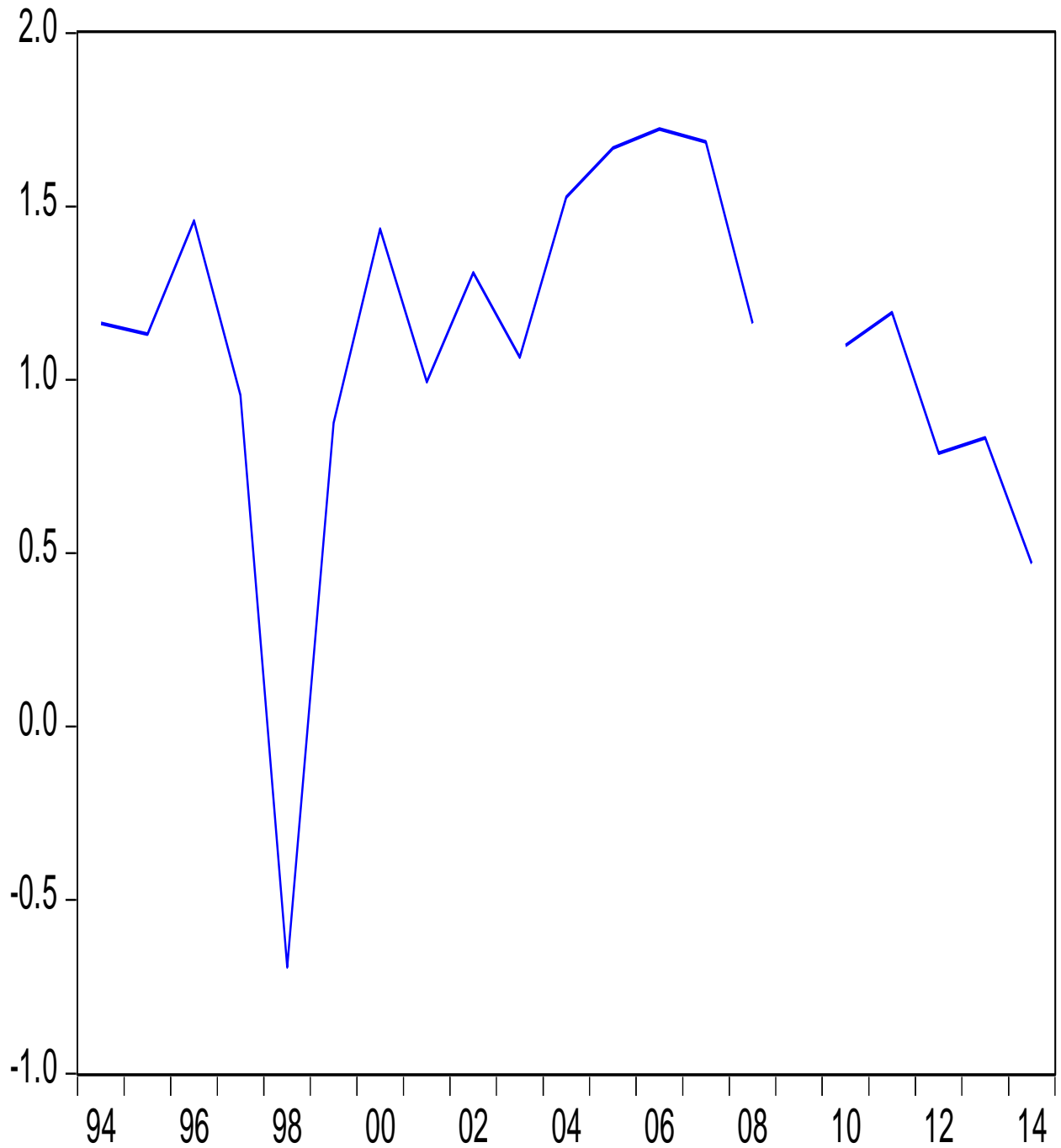
SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

### Appendix 3: Unit Root Tests

#### Level and Intercept

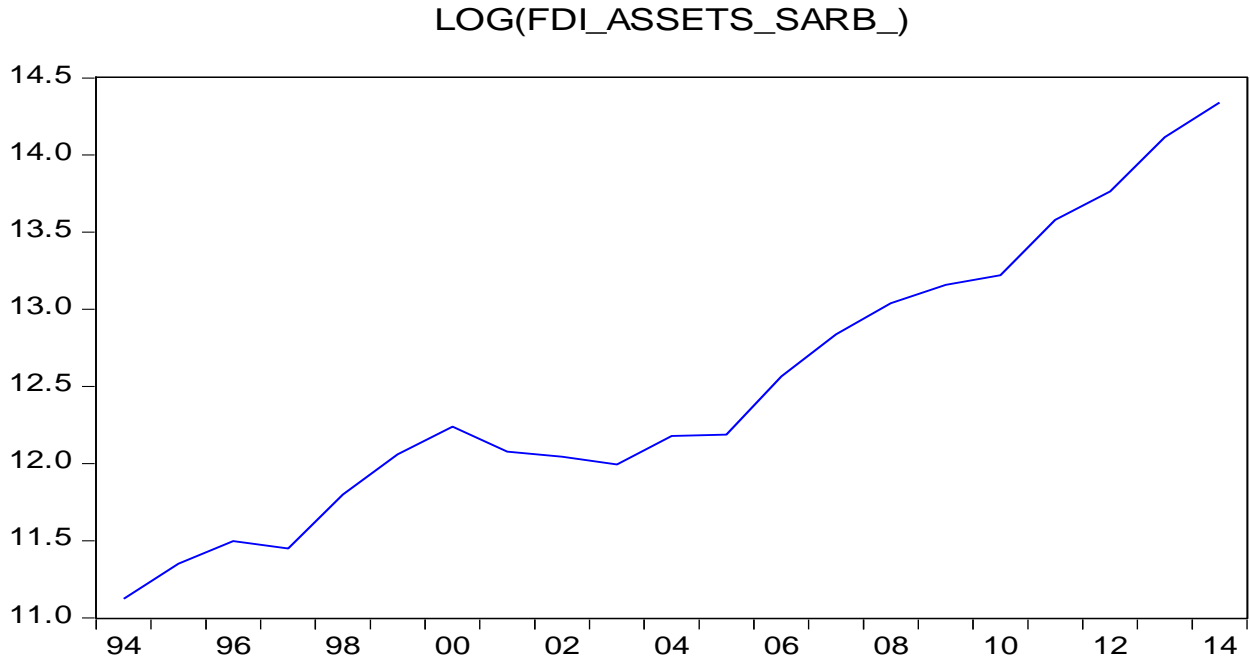
LOG(GDP\_GROWTH)



Null Hypothesis: LOG(FDI\_ASSETS\_SARB\_) has a unit root  
 Exogenous: Constant  
 Lag Length: 0 (Automatic - based on SIC, maxlag=1)

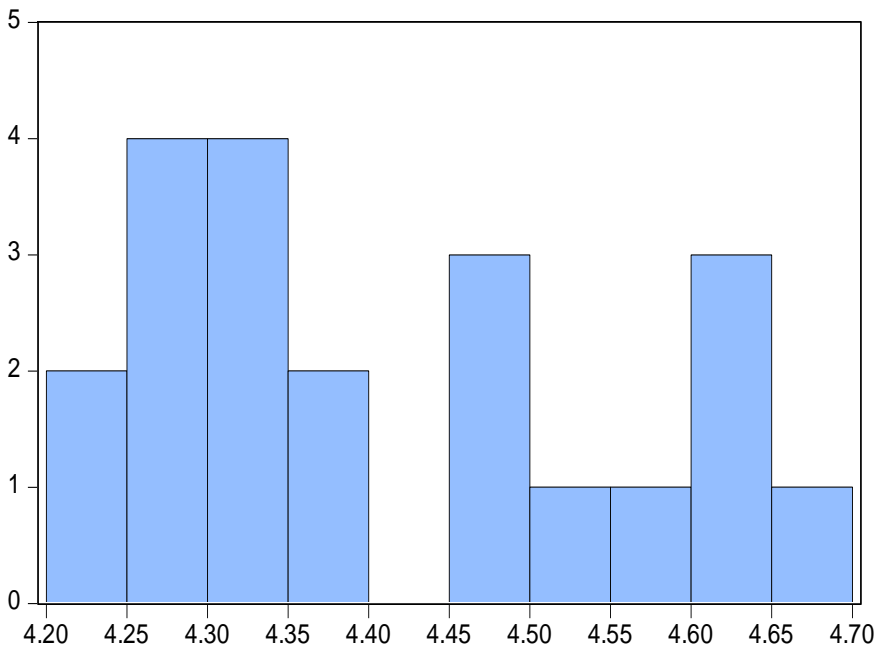
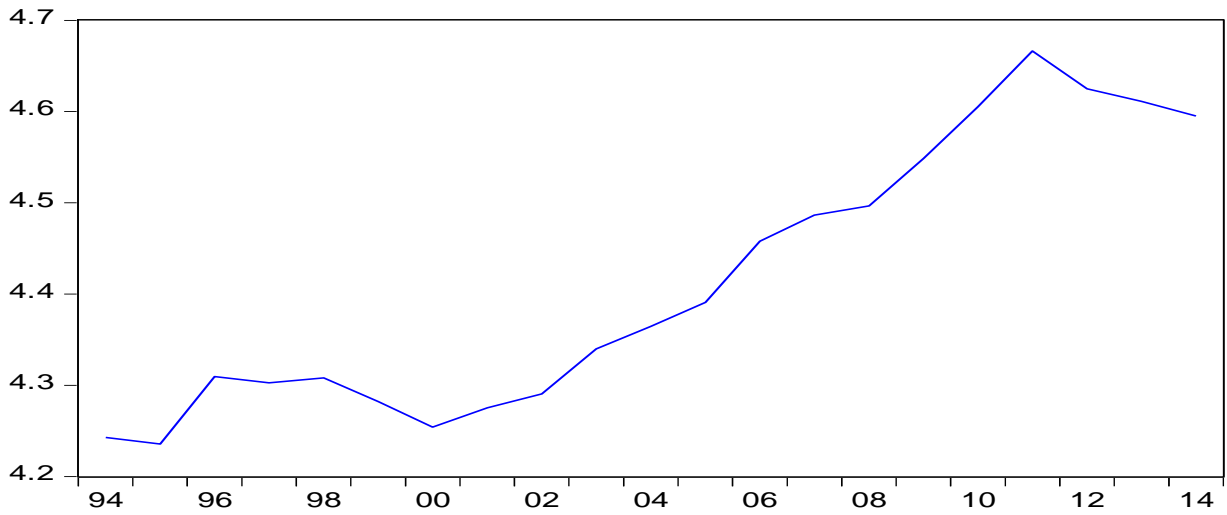
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.933505	0.9938
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

\*MacKinnon (1996) one-sided p-values.





### LOG(TOT)



Series: LOG(TOT)	
Sample 1994 2014	
Observations 21	
Mean	4.413701
Median	4.364372
Maximum	4.666265
Minimum	4.235555
Std. Dev.	0.146636
Skewness	0.390082
Kurtosis	1.618508
Jarque-Bera	2.202530
Probability	0.332450

## First Difference and Intercept

Null Hypothesis: D(LOG(GDP\_GROWTH)) has a unit root

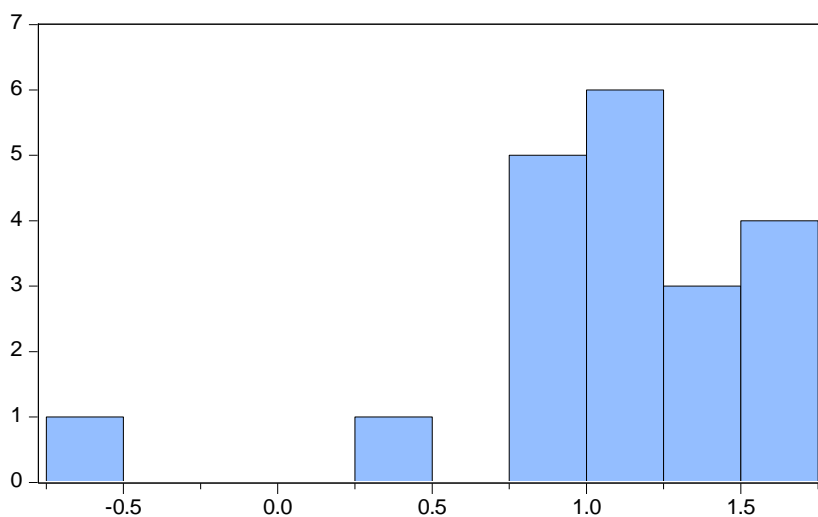
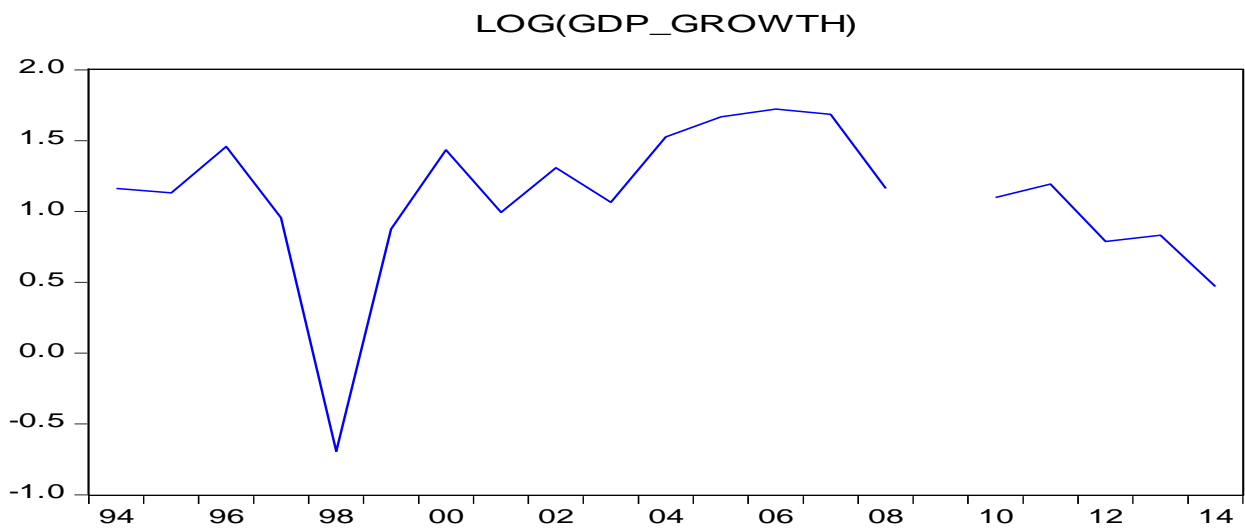
Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.138731	0.0079
Test critical values:		
1% level	-4.004425	
5% level	-3.098896	
10% level	-2.690439	

\*MacKinnon (1996) one-sided p-values.

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 14

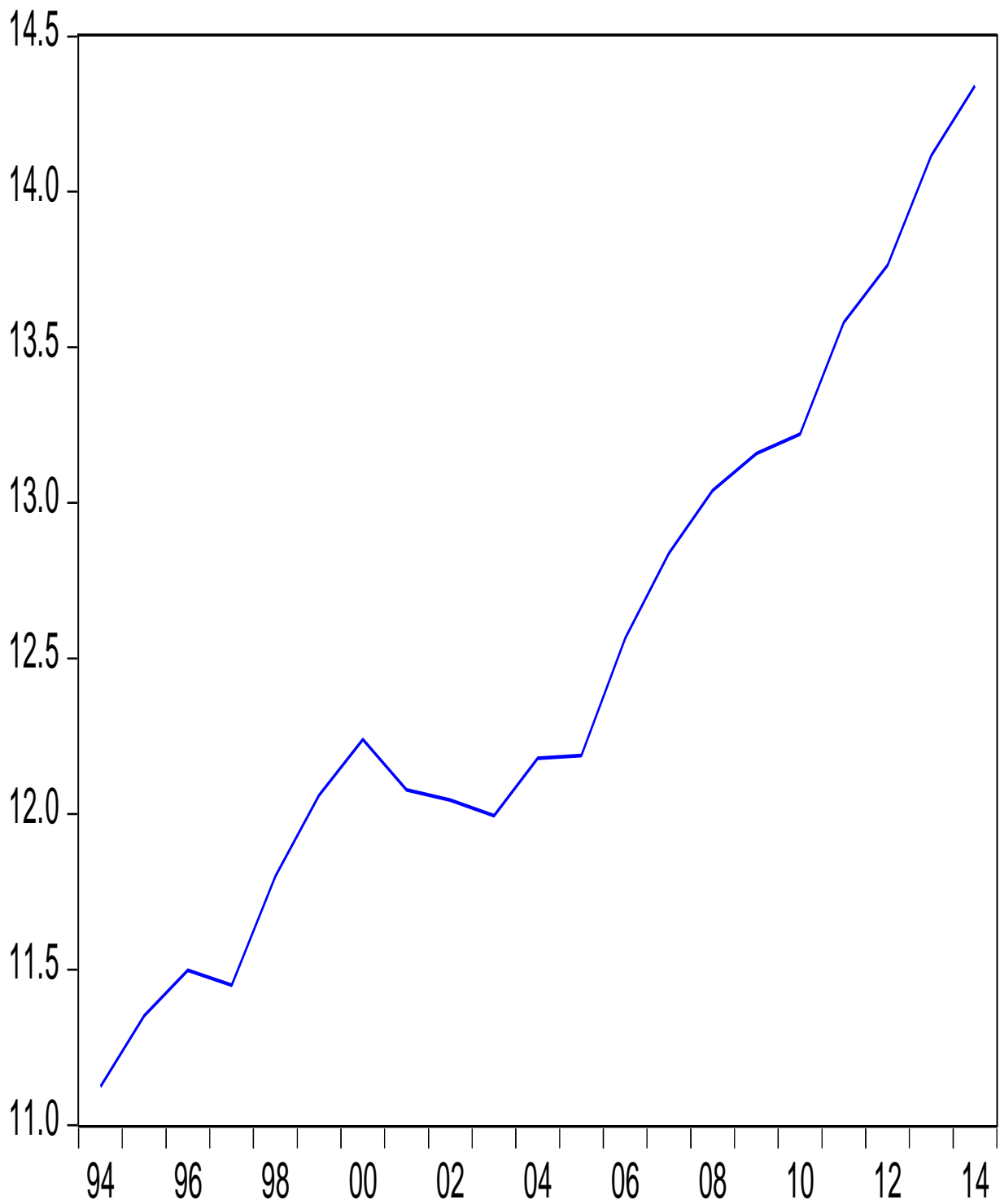


Series: LOG(GDP\_GROWTH)  
Sample 1994 2014  
Observations 20

Mean 1.092118  
Median 1.147276  
Maximum 1.722767  
Minimum -0.693147  
Std. Dev. 0.533161  
Skewness -1.836783  
Kurtosis 7.395119

Jarque-Bera 27.34346  
Probability 0.000001

# LOG(FDI\_ASSETS\_SARB\_)



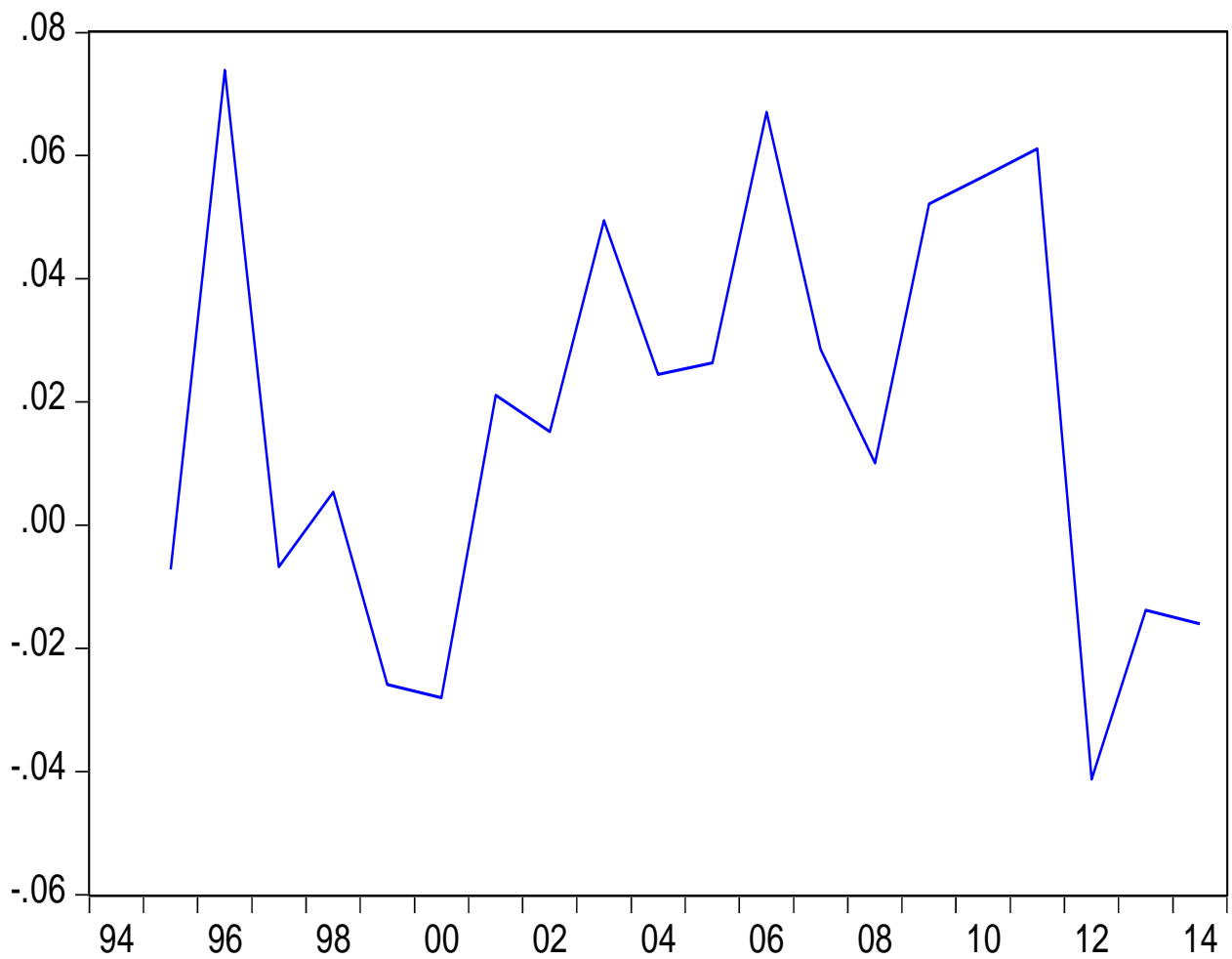


Null Hypothesis:  $D(\text{DLOG}(\text{TOT}))$  has a unit root  
Exogenous: Constant  
Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-7.018987	0.0000
Test critical values:		
1% level	-3.857386	
5% level	-3.040391	
10% level	-2.660551	

\*MacKinnon (1996) one-sided p-values.  
Warning: Probabilities and critical values calculated for 20 observations  
and may not be accurate for a sample size of 18

### DLOG(TOT)





## Appendix 4: Johansen Cointegration Test

Date: 10/09/16 Time: 22:20  
 Sample (adjusted): 1996 2014  
 Included observations: 16 after adjustments  
 Trend assumption: No deterministic trend  
 Series: LOG(GDP\_GROWTH) LOG(FDI\_ASSETS\_SARB\_)  
 Exogenous series: DLOG(TOT)  
 Warning: Critical values assume no exogenous series  
 Lags interval (in first differences): 1 to 1  
 Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.452290	13.15862	12.32090	0.0361
At most 1	0.197806	3.526473	4.129906	0.0716

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

\* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.452290	9.632150	11.22480	0.0941
At most 1	0.197806	3.526473	4.129906	0.0716

Max-eigenvalue test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegrating Coefficients (normalized by b\*S11\*b=l):

LOG(GDP_GROWTH)	LOG(FDI_ASSETS)
-2.666137	0.178976
1.027222	-0.214206

Unrestricted Adjustment Coefficients (alpha):

D(LOG(GDP_GROWTH))	D(LOG(FDI_ASSETS))
0.429630	-0.004427
-0.024244	-0.069472

1 Cointegrating Equation(s):	Log likelihood	-3.772073
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Normalized cointegrating coefficients (standard error in parentheses)

LOG(GDP_GROWTH)	LOG(FDI_ASSETS)
1.000000	-0.067129 (0.01615)

Adjustment coefficients (standard error in parentheses)

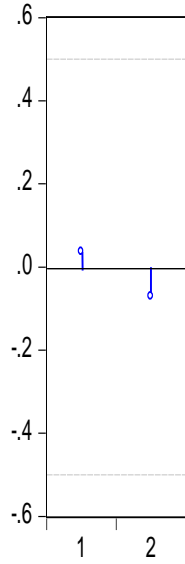
D(LOG(GDP_GROWTH))	D(LOG(FDI_ASSETS_SARB_))
-1.145454 (0.36396)	0.064639 (0.12196)

## Appendix 5: Diagnostic Tests

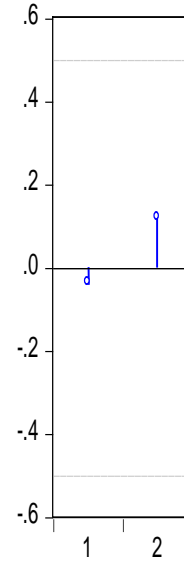
### Serial autocorrelation

Autocorrelations with 2 Std.Err. Bounds

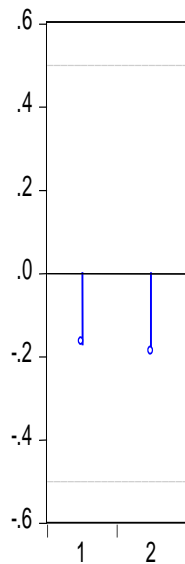
Cor(LOG(GDP\_GROWTH),LOG(GDP\_GROWTH)(-i))



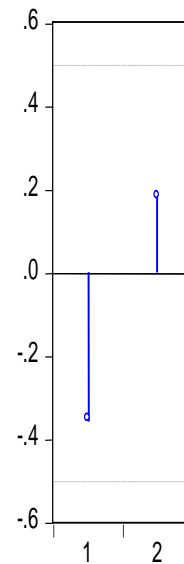
Cor(LOG(GDP\_GROWTH),LOG(FDI\_ASSETS\_SARB\_)(-i))



Cor(LOG(FDI\_ASSETS\_SARB\_),LOG(GDP\_GROWTH)(-i))



Cor(LOG(FDI\_ASSETS\_SARB\_),LOG(FDI\_ASSETS\_SARB\_)(-i))



## Normality Test

Joint	2.333767	2	0.3113
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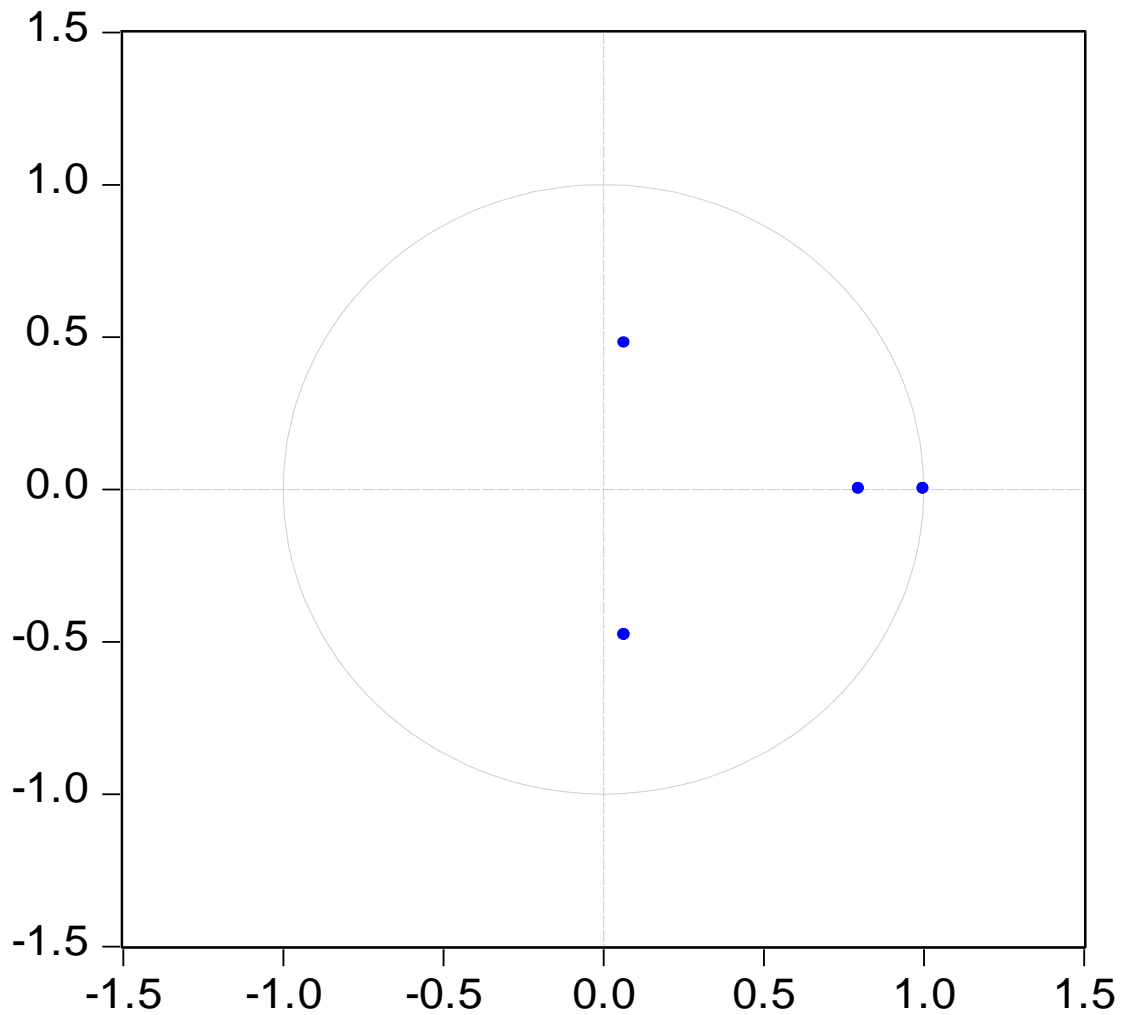
Component	Kurtosis	Chi-sq	df	Prob.
1	3.119848	0.009576	1	0.9220
2	2.748067	0.042314	1	0.8370

Joint	0.051889	2	0.9744
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Component	Jarque-Bera	df	Prob.
1	2.339553	2	0.3104
2	0.046104	2	0.9772
Joint	2.385657	4	0.6652

### Appendix 6: VEC Estimates Stability Test

## Inverse Roots of AR Characteristic Polynomial







## Appendix 7: Annual Data Used in the Study

Period	GDP_growth	FDI_assets	ToT
1994	3,2	67698	69,6
1995	3,1	84991	69,1
1996	4,3	98521	74,4
1997	2,6	93805	73,9
1998	0,5	133178	74,3
1999	2,4	172778	72,4
2000	4,2	206830	70,4
2001	2,7	175695	71,9
2002	3,7	170084	73
2003	2,9	161850	76,7
2004	4,6	194653	78,6
2005	5,3	196313	80,7
2006	5,6	286482	86,3
2007	5,4	376005	88,8
2008	3,2	460024	89,7
2009	-1,5	518785	94,5
2010	3	552071	100
2011	3,3	790273	106,3
2012	2,2	950254	102
2013	2,3	1349855	100,6
2014	1,6	1691089	99

Dear Miss Eva de Abreu

Protocol Number: **Temp2016-01400**

Title: **Examining the Influence of Foreign Direct Investment (FDI) on Economic Growth in South Africa.**

Please be advised that your application for Ethical Clearance has been APPROVED.  
You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,  
Adele Bekker