DETERMINANTS OF PRIVATE FIXED INVESTMENT IN SOUTH AFRICA

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DECLARATION

I declare that "*Determinants of private fixed investment in South Africa"* is my own work, that it has not been submitted for any degree or examination at any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full names..... Date.....

Signed.....

Signature..... Date.....
Supervisor

ACKNOWLEDGEMENTS

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ABSTRACT

This study investigates determinants of private fixed investment in South Africa using macroeconomic time series quarterly data from 1994 – 2015. The determinants of private fixed investment on this study include gross domestic product (GDP), real interest rate, real exchange rate and general tax rate. The aim of this study was to investigate the determinants of private fixed investment in South Africa by employing the Johansen cointegration technique and the VECM analysis. Based on the literature survey it appears that the previous studies mainly focused on private investment in manufacturing and infrastructure sectors therefore this is envisaged to add knowledge to a body of economics literature in this area by focusing more on private fixed investment and its determinants in South Africa. The study concludes that for the period under investigation GDP has the positive sign as expected. This suggests that as it has a positive impact on private fixed investment in the long run. The findings of the study also confirmed that tax rate is a complementary to private fixed investment. Similarly, the real exchange rate coefficient was negative as expected which suggests that the depreciation of the currency stimulates the growth of private fixed investment in South Africa. It is apparent that even the best economic model cannot achieve the expected outcomes immediately but these results encourage the study to believe that the South African monetary policy on exchange rate complements private fixed investment. Therefore, the study proposes that both even though both growth and general tax rate are difficult to accomplish simultaneously, they should be used to promote the flow of private fixed investment in South Africa.

Keywords: Private Fixed Investment, Cointegration, Vector error correction model and South Africa

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
AR	Autoregressive
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
CAPM	Capital Assets Pricing Model
CIS	Co-operative Incentive Scheme
CIP	Critical Infrastructure Program
CVAR	Cointegrated Vector Autoregression
ECM	Error Correction Model
FDI	Foreign Direct Investment
GARCH	Generalised Autogressive Conditional Heteroskedasticity
GDP	Gross Domestic Product
GEAR	Growth, Employment and Redistribution
GMM	Generalised Method of Moments
GNP	Gross National Product
GNI	Gross National Income
G7	Group 7
INF	Inflation rate
IPCMS	Indian Private Corporate Manufacturing Sector
Jipsa	Joint Initiative on Priority Skills Acquisition
LDCs	Less Developed Countries
MTR	Marginal Tax Rates
NDP	National Development Plan
NIPP	National Industrial Participation Programme
NTI	Neoclassical Theory of Investment
OECD	Organisation for Economic Co-operation and Development
POLS	Pooled OLS
PP	Phillp-Peron
RDP	Reconstruction and Development Programme
SMEs	Small and Medium Enterprises
SARB	South African Reserve Bank
SPDMC	South Pacific Developing Member Countries
USA	United State of America

VAR	Vector Autoregression
VECM	Vector Error Correction Model
WG	Within Groups

CHAPTER ONE
INTRODUCTION

1.1 Background of the study

The neoclassical and Keynesian theories regard private investment not only as a source of economic growth but also as a determinant of the potential extent of the national income (Lund, 1979). That been the case, Bint-e-Ajaz and Ellahi (2012) indicated that there have been little available economic models that offer a limited insight into the practical problems facing the developing world concerning private fixed investment. Although a heated debate on economic models have come up in policy-making and academic circles regarding the roles of public and private investment in the process of economic growth has been intensified over a number of years. The only one-sector major macro models of the day, from Keynesian to Harrod-Domar seemed to have relatively little relevance for developing societies.

The economy of South Africa has developed quickly from the time when the apartheid era ended in 1994. South Africa country has become one of the utmost advanced states in the Africa continent. The country has the second largest economy in Africa after Nigeria since 2014, with regard to Gross Domestic Product (GDP). The GDP has improved quicker with a yearly average growth rate of 2.73 percent from 1994-2014 (Lin, Beidari, and Lewis, 2015). Though the government amplified the country's integration into market, the crisis led the GDP to contract to 3.1 percent (South Africa: economy overview 2016). According to Parsons (2004), the success of the South Africa economy after the attainment of independence is evident. The apartheid government left economy branded by high level of inflation, public debt, and high rate poverty, and small social security protection for the most of citizens who are vulnerable. The government faced a daunting task in attempting to stabilise such an economy.

In terms of this view, it appears to be imperative to investigate private fixed investment as an underpinning determinant needed to achieve sustainable growth rates, especially in developing economies such as South Africa (South Africa: economy overview 2016). This was a reflection of the best economic policies implemented by the government that has made South Africa economy stronger and better. That been the case, the global economic crisis (2008-2009) did not spare the South Africa economy.

Du Plessis and Smith (2007) highlight that for the past years; the real economic growth rate was more or less around 3.1 percent. This symbolised a large enhancement on the average growth rate of 0.8 recorded from the previous years ago. This improvement was welcomed, but the growth rate of South Africa still endured moderately little behind the world standard.

Several studies such as Clarke, et al., (2006), du Toit and Moolman (2004), Baxter and Contogiannis (2008) also indicate that there is a low level of investment in South Africa. According to Mlambo and Oshikoya (2001), declining investment ratio and levels is a problem. The challenge is that it matters a lot for growth as low investment leads to low economic growth. EI-Wahab (2005) maintains that the macro economic development of South Africa after the democracy has not be impressive, though the overall investment hovering around 15 to 16 percent, as compare to the unofficial benchmark of 25 percent. This level is far lower than the competitors of South Africa such as Poland, Brazil, and some of the economies in the Asia. A strong climate of investment is a platform for economic success (Fan, Reis, Beath, Jarvis & Frauscher, 2007).

As a member of the G20 countries, foreign investors sees South Africa among the lower-risk destination place in Africa to invest. It also the largest investor in the continent in that it exports 25 percent of its products into the African continent. This is mainly driven by the government's strategy of pursuing a rigorous programme to attract foreign capital and commercial activity through investment incentives and industrial financing interventions (South Africa: economy overview 2016). The World Investment Report (2015), stated that the global foreign direct investment (FDI) reduced by 16 percent to $1.23- trillion in the year 2014. The report further indicates that South African FDI condensed by 31.2 percent to $5.8-billion in 2014, a downward trend from 2013 that received a flow of $8.3-billion. This shows a reduction of R42-billion of FDI in 2011, which was more than four times the amount of FDI in 2010.

According to Celebi and Akkina (2002), in less advanced nations, it is assume globally and recognised that there is a relationship between public investment and private fixed investment. Although this notion exists, there is a doubt on how public sector overall fixed investment increases or drops private fixed investment. Celebi and Akkina (2002) also highlighted that in less developed economies, the application of all sectors capability is very low as compared to the developed countries, and could be attributed to various reasons. It is evident that the low utilisation of capability would definitely affect spending by private fixed investment negatively, though there would be an anticipation positive and quick change in the factors of

ideal investment. The use of capability rate could be employed to regulate the effect of the cycle of businesses in order to explain the spending by private fixed investment in less developed countries. Celebi and Akkina (2002) also explained that the use of taxes, debt issuance, or decreasing the economy physical and financial resources available to private sector inflation could be used in bankrolling public segment infrastructure and non-infrastructure investment, and therefore crowd out investment by the private sector.

The chosen study period (1994-2015) is considered because South Africa was undergoing transformation from the apartheid government to a democratically elected government.

EI-Wahab (2005) points out that the investment climate survey indicates that generally, South Africa has a favourable investment climate. However, the volatile exchange rate seems to be a problem for exporters. In addition to that, the cost of labour in South Africa is high, particularly for workers who are skilled. Labour directive is burdensome and the rate resulting from high crime. Through these obstacles, in the coming years South Africa will have to face challenges such as poverty and high levels of unemployment.

The South African government therefore is faced with the responsibility of coming with new policies and strategies which would bring economic reforms, install investor's confidence and attract new domestic and foreign investors. The new government after 1994 had to put in place strategies and policies of improving private fixed investment. These strategies include the Growth, Employment and Redistribution (GEAR), Reconstruction and Development Programme (RDP), Accelerated and Shared Growth Initiatives of South Africa (ASGISA), Joint Initiative on Priority Skills Acquisition (Jipsa) and National Development Plan (NDP). Weeks (1999) states that the RDP, adopted in 1994, was the government's economic policy framework aimed at increasing private fixed investment.

Lunds (1979) argues that the neoclassical and Keynesian theories regard private investment as a determinant of the potential extent of the national income; and does not single it out as a foundation of economic development. In terms of this view, private fixed investment seem to be an underpinning determinant needed to achieve sustainable economic growth rates that create employment, alleviate poverty and stamp out unequal distribution of income in the South African economy. The section below discusses the problem statement of the study.

1.2 Problem statement

It has been observed that during the period 1994-2015, fixed investment by private sector levels as against percentage of GDP revealed an unreliable and descending trend in South Africa. This is confirmed by the data from the South African Reserve Bank (SARB). Similarly, a recent research by Laubscher (2015) indicates that private investment fell cumulatively by approximately 15 percent from its peak in 2008, compared with 25 percent decline in the advanced economies. However, private investment has declined from 70 percent of total investment in 2007 to 63 percent in 2014.

Several studies (Clarke, et al., 2006, du Toit and Moolman 2004, Baxter and Contogiannis 2008) also indicated that there is low performance in investment in South Africa. According to Mlambo and Oshikoya (2001), declining investment ratio and levels is a problem for the country. Firstly, growth is impacted positively by investment and then, low economic growth is as a result of low investment (Mlambo and Oshikoya, 2001).

Ndikumana (2005) identifies low investment as a leading cause of slow economic growth. In this regard, private investment in South Africa deserves to be given a serious attention. It is against this background that, this study intends to identify determinants of private fixed investments and to quantify the significance of these dynamics. The study also seeks to determine the existence of relationships between private fixed investment and its determinants in the South African economy.

1.3 Research aim and objectives

The main aim of the study is to investigate the determinants of private fixed investment in South Africa.

The aim will be achieved through these specific objectives:

- To analyse the trend of the determinants of private fixed investment.
- To use the Johansen (1988) cointegration technique to determine the relationship between private fixed investment and its determinants.
- To make policy recommendations.

1.4 Hypothesis of the study

The null hypothesis of this study are as follows:

Ho: $\beta = 0$, there is no relationship between private fixed investment and the selected determinants.

H1: $\beta \neq 0$, there is relationship between private fixed investment and the selected determinants.

1.5 Significance of the Study

The result of this study is envisaged to add knowledge to a body of economics literature and to assist other researchers to understand the relationship between private fixed investment and its determinants. The purpose is to guide private investors in investment decision-making, and to assist policy makers in formulating broad investment strategies that will improve business confidence to local and foreign investors with a view to increasing private fixed investment in the South African economy.

This study will also help other developing countries to improve on their private fixed investment by clarifying the relationship between private fixed investment and its determinants, as well as by showing the impact private fixed investment will have on their respective economies. The study, therefore, helps to understand the relationship between private fixed investment and its impact on the South Africa economy with the given determinants. Based on the literature survey it appears that the previous studies mainly focused on private investment in manufacturing and infrastructure sectors therefore this is envisaged to add knowledge to a body of economics literature in this area by focusing more on private fixed investment and its determinants in South Africa.

In determining the relationship between private fixed investment and its determinants, the present study attempts to fill the existing gap in economic literature. In so doing, existing data will be analysed to establish the relationship between private fixed investment and its regressors.

1.6 Organisation of the study

The chapters in this dissertation are presented as follows: Chapter one presents the introduction to the study. Chapter two is an overview of the South African economy. Furthermore, chapter

three discusses literature review where the theoretical literature of investment and empirical evidence are presented. Chapter four presents the methodology followed by the study. Chapter five is the analysis and interpretation of the results and the discussions thereof (econometric analysis). Finally, chapter six pays attention to the summary, conclusion and policy recommendation of the study.

CHAPTER TWO

OVERVIEW OF PRIVATE FIXED INVESTMENT AND ECONOMY OF SOUTH AFRICA

2.1 Introduction

This chapter presents an overview of private investment in South Africa. The study pays attention on the period from the year 1994 to 2015. The following section provides stylised facts about the South African economy. In section 2.3 the study discusses trends of selected variables and private fixed investment, while section 2.4 highlights methods that were undertaken to improve investment environment in South Africa. Lastly, section 2.5 provides the chapter summary.

2.2 Economic growth performance of South Africa since 1994

Faulkner and Loewald (2008) indicated that before the era spanning from the end of world war two to 1994, the South Africa economy confronted the poorest time of economic growth with declining growth variables. Trade and financial sanctions implemented by the world in objection to apartheid regime resulted in the slow growth of the economy. These sanctions led to higher inflation, increased doubt and investment decline due to political instability and macroeconomic policy decisions (Faulkner and Loewald, 2008).

Peaceful and stable investment environment and the creation of opportunity for reversing negative investor sentiment among other factors, was achieved through democracy. The improvement of the South Africa growth performance was due to sound political and economic leadership through the enactment of effective formulation of policy, development of institution, the design of regulations and vision of the economy. A sound macroeconomic management and prudent fiscal policy are the most important factors for conducive environment for economic stability and growth that lead to lower cost for capital and positive influence on the rate of real exchange (Faulkner and Loewald, 2008).

A background outline of the South Africa economy reveals a number of policy initiatives that have shaped and directed fiscal policy for the past years (SARB, 2013). Act No.108 of South Africa's new Constitution enacted in 1996 led to key transformations in the Republic. Economic activities such as the Reconstruction and Development Programme (RDP) was

brought about as a result of such major reforms. The RDP main objectives was to improve the economic living standard of the people in the Republic (SARB, 2013).

The changing of macroeconomic position by the government led to the implementation of the Growth Employment and Redistribution (GEAR) programme (Pumela, 2015). The content of GEAR strategy clearly shows the main government fiscal policy objective that was announced in 14 June 1996. The objective of the fiscal policy was to ease budget shortfall and lack of government savings, circumvent perpetual escalations in the whole tax burden, consumption reduction in expenditure by the government in general comparative to the gross domestic product. The fiscal policy objective also stresses the need to reduce government wage and salary to the acceptable limit so as to increase the gross domestic fixed investment through the strengthen of government general contribution (SARB, 2013). The Finance Minister in the 1997 budget speech stressed that the effective implementation of the GEAR strategy would determine the success of the RDP project that the government has initiated and was dedicated to.

In 2001 the government adopted a relaxed fiscal policy approach with the intention of pushing up the budget for 2006. The aim was to provide significant resources for infrastructure investment and actual expenditure increase (Pumela, 2015). To curtail unemployment and poverty to the minimum acceptable limit by the year 2014, the government initiated the economic policy named Accelerated and Shared Growth Initiative for South Africa (AsgiSA). To support this initiative, government decided to peg the capital expenditure to the then current expenditure.

The AsgiSA project was officially launched in February 2006 by Ms Phumzile Mlambo-Ngcuka, the Deputy President of the republic during that time. After the launching of the AsgiSA, Joint Initiative on Priority Skills Acquisition (Jipsa) was set-up to address the shortage of skills to meet the main objective of the AsgiSA programme. The following limitations were identified as factors that hinder the country from achieving the growth rate it has predicted:

- The currency volatility;
- The countrywide logistics structure cost, effectiveness and capability;
- Suitably skilled labour unavailability and the impact of apartheid government on low skilled labour costs;

- Lack of new investment prospect and restrictions to competition;
- Higher burden on small and medium enterprises (SMEs) as a result of stricter regulatory environment; and
- Incompetency within governance, capacity and state bodies.

The government's intention to create five million jobs in the next ten years to come led to the announcement of the New Growth Path by the Minister of Economic Development in 26 October 2010. Critics questioned the scanty detail in the plan as it only focussed on job creation.

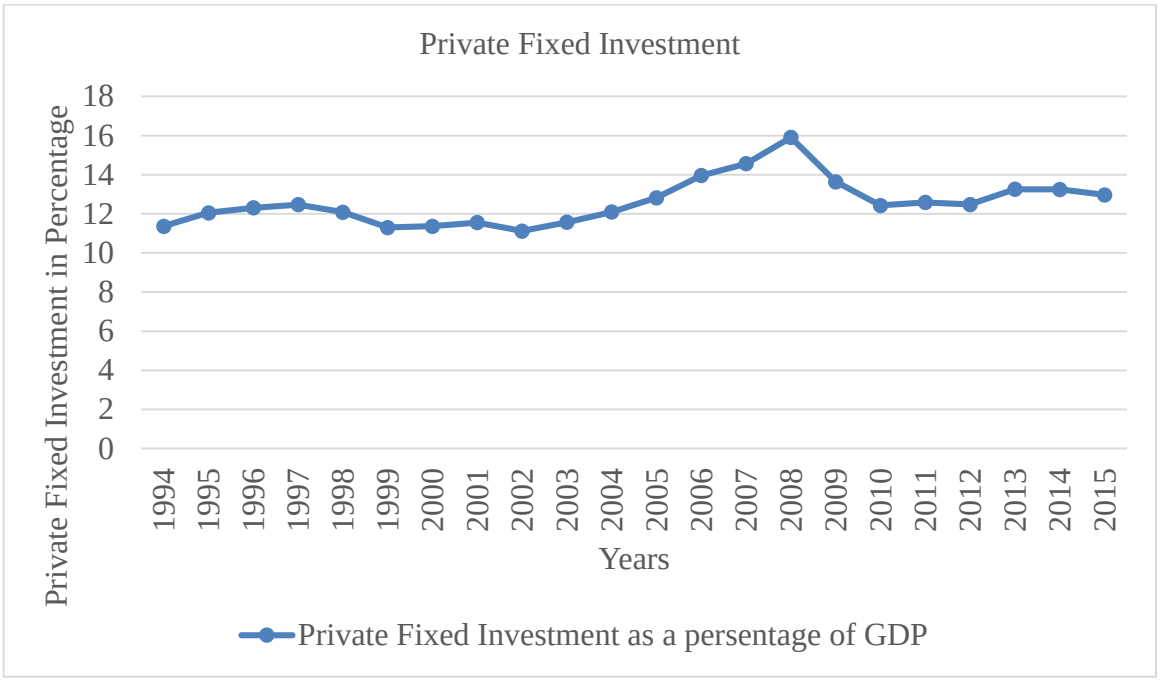
Mr Trevor Manuel who was then National Planning Commission Minister in the Presidency announced the National Development Plan (NDP) on the 15 August 2012. The NDP summarizes long-term perspective, desired destination description and the different sectors in the society that need to be brought into play in order to attain the objectives outlined in the plan. The abolition of poverty and the decrease of disparity by the year 2030 was the main aim of the NDP. As the NDP states, the main goals in the plan could be achieved by the country through inclusive economy, labour workforce, capabilities building, capacity enhancement in the state, society partnership, and leadership promotion (Pumela, 2015).

2.3 Trends on Private fixed investment and other macroeconomic variables in South Africa from 1994 to 2015

2.3.1 Private fixed investment trends

Figure 2.1 represents Private fixed investment growth rate trends from 1994-2015. Private fixed investment in this study includes machinery and other equipment such as transport equipment, residential buildings, non-residential buildings and construction. Different authors such as Acosta and Loza (2005) express it as a percentage of GDP, while Ndikumana (2005) measures it as a ratio of capital stock. However, this study follows Acosta and Loza (2005) who expressed it as a percentage of GDP.

Figure 2.1: Private fixed investment growth rate



Source: Data from SARB (2015)

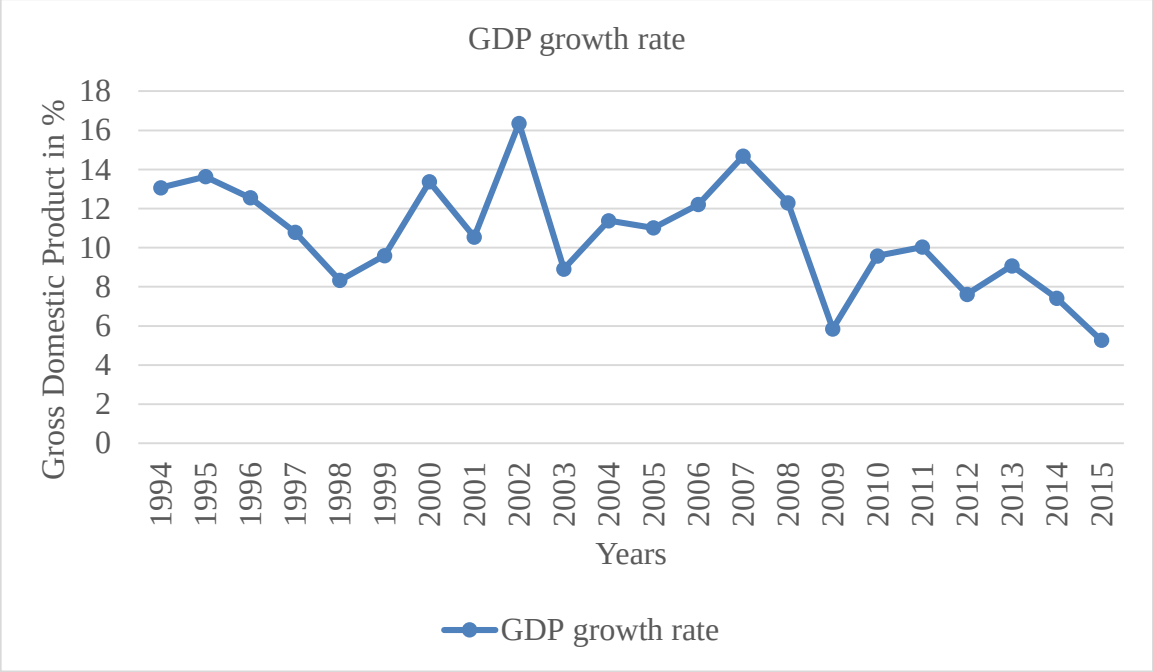
Figure 2.1 above shows that the year 1994 witnessed private fixed investment at 11.4 percent, it then rose up to 12.5 percent in 1997. It fell to 11.3 percent in the year 1999 and thereafter, there was a steady rise till 2008 when it reached a pick of 15.9 percent. The sudden resilient private fixed investment surge in the year 2008 had a positive influence on the economy and it supported strong economic development and job creation (Tchouassi and Ngangué, 2014). From 2009 to 2010 there was a sharp decrease in private fixed investment from 15.9 percent in 2008 to 12.4 percent in 2010. The decrease in the level of private fixed investment did not support growth rates. It should be noted that since the 2008 global financial crises, the investment by the private sector has not been good and remains low. According Phetsavong and Ichihashi (2012), the economic growth is impacted positively by private domestic investment, while the second most important factor is FDI. However, from the above analysis in figure 2.1, one could see that Private fixed investment remained steady between 2010 and 2012 at 12.6 percent, but in 2012 it rose again. After a stable rise of private fixed investment in 2012 to 2014 from 12.7 to 13.4 percent, it declined slightly in 2015 to 12.9 percent. According to Fedderke and Romm (2006), there is a dependable relationship between foreign and domestic investment in the long run. This is an indication of a positive flowing of high-tech investment from foreign into domestic capital. The researchers believe that there is a

crowd-out of domestic investment from foreign direct investment, nevertheles this impact has a short term run restrictions. They also discovered that FDI in South Africa is capital intensive, signifying that FDI investment is horizontal and not vertical (Fedderke and Romm 2006). In South Africa, the net rate of return determine the foreign direct investment, together with the FDI liabilities risk profile. Reducing political threat, ensuring property rights, supporting market size growth, wage control, as well as dropping business tax rates, would increase Private fixed investment growth rate (Fedderke and Romm 2006).

2.3.2 The gross domestic product (GDP) growth rate trends

Figure 2.2 represent Gross Domestic Product (GDP) growth rate trend from 1994-2015, the figure illustrate the growth rate of the GDP have been positive for the entire period under study. This study employs data from the South African reserve bank.

Figure 2.2 shows the trends of GDP growth rate for the period understudy



Source: Data from SARB (2015)

Between 1994 and 2015 the overall GDP grew by 10 percent in average after the end of the apartheid government in South Africa. The graph in Figure 2.2 shows how GDP fluctuated from the year 1994 by 13.07 percent to 13.63 percent in 1995 and downswing sharply in 1995 to 1998 from 13.63 to 8.33 percent. However, from 1998 GDP growth showed an inconsistent behaviour until its reached its peak in 2002 by 16.36 percent. This is mainly as a result of

increased of investment in manufacturing, mining and real estate activities. According to Yip, Lim and Lean (2016), an increase in investment is common indicator economic performance of the country. However the GDP rate start to decline to 8.91 in 2003.

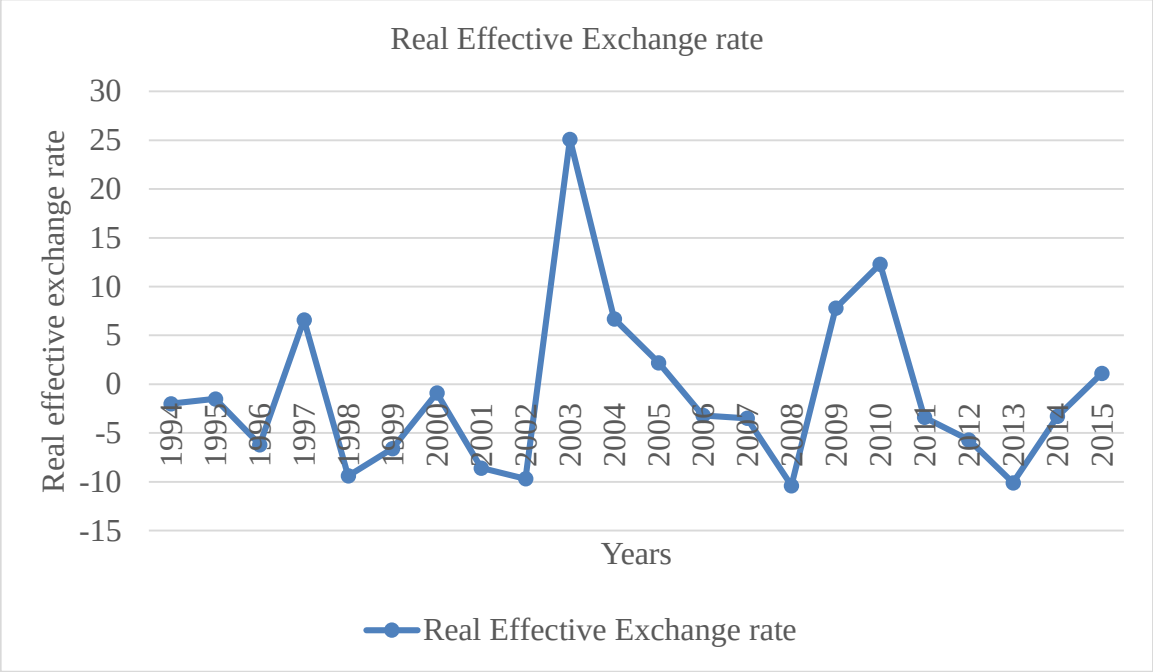
Between 2003 and 2007, there was a sharp rise in the GDP growth from 8.91 to 14.68 percent, before it declined to 5.85 in 2009. Between 2009 until 2011, GDP growth increased by 4.18 percent from 5.85 percent to 10.03 percent, then decreases to 7.62 in to the 2012 and increase quickly to 9.07 percent in 2013. However, between 2013 and 2015 the GDP growth was performed badly as it decreased by 3.8 percent from 9.07 percent to 5.27 percent in 2015. To maintain and strengthen GDP growth would depend on the effective public finance policy that would guide the effective use of public funds, effective trade reforms coupled with trade sanction removal. Consequently, this would lead to poverty reduction and an increase in the employment rate.

Samuelson and Nordhaus (1998) explain the relationship between investment and production through the accelerator theory. The value of the anticipated capital stock rest on the demand level and the demand for goods in a country plays a key part in the growth of the output. For the purpose of this study, the GDP growth includes private consumption, public investment, private investment, government investment, general government expenditure and the balance of payment, that is, exports less imports. Baddeley (2002), stated that the accelerator theory focuses on the output growth as the key factor of investment decisions and is considered as Keynesian because they focus on quantity adjustment.

2.3.3 Real effective exchange rate trends

Figure 2.3 represents the annual data for real effective exchange rate from 1994 -2015. The data was sourced from the Reserve Bank of South Africa. The figure shows that the real effective exchange rate have been showing a negative and positive trending for the entire period under study.

Figure 2.3: Real effective exchange rate in South Africa



Source: Data from SARB (2015)

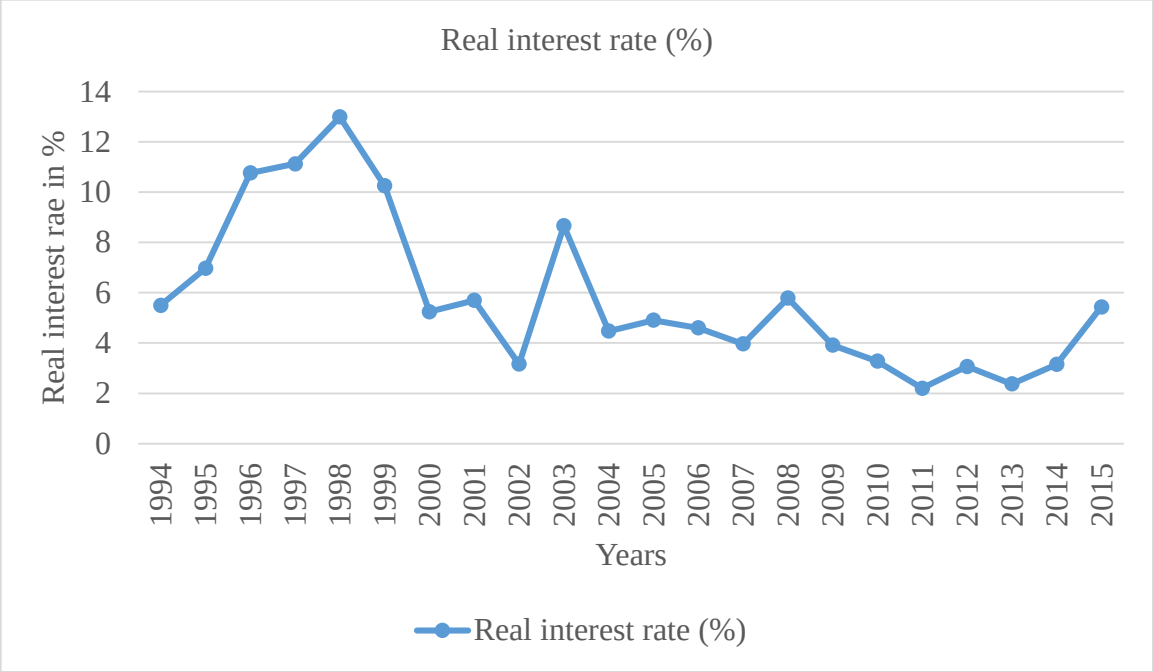
Figure 2.3 shows the real effective exchange rate from 1994 to 2015. At the beginning of year one which is 1994, the Real exchange rate stood at negative 2 percent. It then increased slightly to negative 1.5 percent in 1995, in 1996, the real exchange rate further declined to negative 6.2 percent. From 1996 there was a huge increase of positive 6.6 percent in 1997. The real exchange rate dropped to negative 9.4 percent in 1998 and thereafter it remain slightly up until year 2000 when it reached negative 0.9 percent. In the year of 2002, the real exchange rate decreased to negative 9.7 percent. In 2003, there was a sharp jump of positive 25.1 percent in the real effective exchange rate and this was mainly caused by world commodity prices increase. It should be noted that increase in exchange-rate instability have uncertain effects on global export and import flows (MacDonald and Ricci, 2003). According to Serven (2003), if the real exchange rate is high its instability characterises emerging economies generates unclear atmosphere for investment decisions by creation of complete and virtual sectoral productivity and the cost of new capital goods all harder to predict. Several emerging economies faces high real exchange rate instability. This interprets into a high point of doubt for private investors concerning equally the profitability and investment cost. Unpredictable real exchange rates are related with inconsistent swipes in the comparative efficiency of investment in the trade and non-traded goods sectors of the economy; due to the huge import content of investment in emerging countries, new capital goods cost turn into indeterminate (Serven, 2003).

Between 2003 and 2008 the rate remained on a downward spiral to negative 10.4 percent at the end of 2008. From 2008, the real exchange rate continued an upward movement till 2010 when it settled at positive 12.3 percent. In the year of 2013 it declined to negative 10.1 percent and thereafter, it started increasing gradually and finally reached positive 1.1 percent in 2015.

2.3.4 Real interest rate trends

Figure 2.4 represents real interest rate trend from 1994-2015, the data was sourced from South African reserve bank. The real interest rate is the difference between nominal interest rate and the inflation rate.

Figure 2.4: Real interest rate trend



Source: Data from SARB (2015)

The real interest rate diagram in figure 2.4 shows how the real interest rate has been performing between 1994 to the year 2015. In 1994, the real interest rate stood at 5.49 percent and in 1995 the figure shows a marginally increase of 1.48 percent to 6.97 percent. The rate kept on increasing gradually followed by a steep increase in 1998 to 12.99 percent. This steep increase could be attributed to measures adopted by the reserve bank to combat inflation (Weale, Blake, Christodoulakis, Meade, and Vines, 2015). However, in the year of 2000, there was a sharp decline of 7.75 percent from 12.99 percent to 5.24 percent.

The rising of the real interest rate was evident in 2001 when it slightly rose by 0.45 and declined again to 3.16 percent in 2002. Between 2002 and 2003, the real interest rate increased abruptly from 3.16 to 8.66 percent and decrease to 4.47 percent in 2004. It slightly increased by 0.44 percent in 2005 and decreases steadily from 2005 until 2007, from 4.91 percent to 3.97 percent. It started rising again from 3.97 percent to 5.78 in 2008. From 2008, the real interest rate decreased from 5.78 percent to 2.20 percent in 2011 and slightly upsurge 0.86 percent from 2.20 to 3.06 in 2012 and decreased again to 2.37 percent in 2013. The real interest rate between 2013 to 2015 increased to 5.44 percent.

Generally, an increase in interest rate discourages investment. However, according Ahmad and Qayyum (2008), private fixed investment is reflected to be adversely linked to doubt because fixed investment decisions cannot be incomplete. This study employs real interest rate as capital cost. This is consistent with researchers such as Ndikumana (2005) and Caselli, Pagano and Schivardi (2002) who have identified real interest rate as representative of cost for capital. According King'Ori (2007), the neoclassical model of investment takes the user cost of capital into account. High interest rates mean high cost of capital. The study integrates the real interest rate to apprehend the effects of interest rate on private fixed investment.

2.3.5 General taxation rate trends

Figure 2.5 represents the tax rate from 1994 – 2015, the study used tax payable by companies as percentage of total revenue, the data was sourced from the South African Reserve Bank.

Figure 2.5 General Tax rate

Source: Data from SARB (2015)

In the year 1994, according to figure 2.5, tax was at 13.6 percent. It then dropped to 13.1 in the following year. It moved upward by 3.8 percent to 16.9 percent in 1998. Taxation marginally decreased to 15.5 percent in 1999 and remained stable for a year. Between 2000 to 2002, it sharply increased to 24.7 percent before it then decreased by 1.5 percent to 23.2 percent in 2004. It continuously increased until it reaches its peak in 2008 by 30.3 percent. The high tax rate was as a result of government measures to reduce the consumption of certain products which are deemed to be harmful for intake. High consumption of sugar beverages increases obesity. Taxes on Tobacco and alcohol products have been effective strategy in reducing tobacco and alcohol use. A middle-income country such as South Africa is leading in the area of tobacco tax policy (Blecher, 2015). However the tax rate dropped to 20.6 percent between 2008 and 2015.

The findings by Gary, Moore, Sisneros and Terando (2011) suggested that there was negative association that exists between changes in inter-corporate investment and deviations in separable capital gains marginal tax rates (MTRs). No negative association was found between changes in dividend MTRs and individual ordinary. The results of their study enforce the idea that responds by corporations to the after-tax of return or market effectiveness magnitudes as

a result of changes in individual capital gains MTRs. The relationship between changes in inter-corporate investment and deviations in commercial MTRs on ordinary income was found to be a positive in nature. The consistency of these findings was in line with organisations reducing the operational growth strategies and as a substitute to investing free cash flows in equity securities as MTRs increase (Gary *et al* 2011).

2.4 Measures to improve the investment climate in South Africa

2.4.1 Incentives for local and foreign investors

The government of South Africa and non-government organizations (NGOs) offer a wide range of tax incentives with regard to investment for local and foreign investors in order to attract more investment. Different incentive arrangements for particular sectors are explored in this segment.

2.4.1.1 Co-operative Incentive Scheme (CIS)

The Department of Trade and Industry (DTI) (DTI, 2008) describes a co-operative as an independent group of people voluntarily unified in their quest to find a common economic, social and cultural needs and objectives through mutually maintained and fairly controlled initiative. According to Deloitte, Touch and Tohmatsu (2009), one of the DTI's flagship projects for the year 2004 and 2005 was the promotion of co-operatives. The incentive plan with regard to co-operative was set up to support government ingenuities to the improvement and advancement of co-operatives as a sustainable form of enterprises in South Africa. Registered co-operatives operating in the developing economy are the main targets for this type of incentive (Deloitte *et al*., 2009).

2.4.1.2 Critical Infrastructure Program (CIP)

Economic infrastructure which is a requirement for productive investment is supported by the Critical Infrastructural Programme (CIP). Companies qualifying development costs are also assisted by CIP with regards to grant top-up and funds between 10 percent to 30 percent (DTI, 2009). Competitive improvement of South African industries is the main aim of the CIP. By doing this, growth and employment creation would be realised. CIP also supports industrial activities growth that have positive economic impact on South Africa (DTI, 2009).

2.4.1.3 Developmental Electricity Pricing Programme (DEPP)

The government established Developmental Electricity Pricing Programme (DEPP) to help attract investment in the field of industries with the aim of supporting economic growth and employment. Manufacturers are supported with economically internal electricity charges through the scheme (Deloitte *et al.,* 2009). The scheme relates to investment in the industry projects that benefit small businesses by utilisation of equal pricing policy and local policy in supply. The scheme offered benefit of cheaper electricity tariffs for seven years to industries. The cheaper electricity tariffs would enable internal rate of return to ensure the project creation in South Africa. Though investment companies have made appeal to the government to give an extral 15 percent allowance to companies who uses energy efficient equipment (Deloitte *et al.,* 2009).

2.4.1.4 Research and Development (R&D) Tax Incentive Programme

Department of Science and Technology (DST) in partnership with the South African Revenue Services (SARS) introduced R&D Tax incentive programme in 2006. This incentive was aimed at inspiring companies in South Africa and South African taxpayers in the field of innovation, scientific, technological research and development. All qualified scientific or high-tech R&D carried out by taxpayers in South Africa qualify for 150 percent reduction in such expenditure (DTI, 2009). The R&D plan permits for faster devaluation of possessions for purposes of scientific and technological R&D over three years period at a rate of 50:30:20 for the assessment period in which the asset was first brought to use. The claim could be made by the taxpayers on remunerations, material, buildings, machinery, and equipment and contracted R&D (DTI, 2009).

2.4.1.5 Small and Medium Enterprise Development Programme (SMEDP)

In order for the government to encourage foreign investment, generate employment, opportunity for the introduction of fresh and advanced skills, the Small and Medium Enterprise Development Programme (SMEDP) programme was established. Incentives are offered by the scheme to companies who are planning to expand existing South African based productions. Tax free of 10 percent of cash grant of qualifying investment cost could be claimed by qualified businesses (Maxwell, 2007).

2.4.1.6 Public Private Partnership (PPP's)

Public Private Partnerships (PPP's) was set up to inspire the private and public sector uniting to invest in infrastructure. The scheme offered grants from the government and used by taxpayers to improve state-owned property, in line with the terms and conditions of lease agreement with the state. Those who in receipt of government grants are exempted from tax. Such tax allowance is claimed by the tax payer in respect of improvements effected by the taxpayer (Deloitte *et al*., 2009).

2.5.1.7 National Industrial Participation Programme (NIPP)

The government of South Africa launched the national industrial participation programme (NIPP). The NIPP's mission aims to influence economic welfares and to upkeep the improvement of the industries in South Africa by utilising the government procurement instrument. The aim of this scheme is to use government procurement to influence investment, exports and technology development.

State-owned and government enterprises procure or rent treaties goods, apparatus and services with an imported content equal to or exceeding US$10 million have been subject to Industrial Participation (IP) responsibility since September 1996 (DTI, 2007). The NIPP targets precise business zones and highlights marginalized groups as recipients. The Department of Trade and Industry is presently monitoring obligations to the value of US$16 billion. Since the inception of the NIPP in 1997, the bigger share of its tasks began in 2000, succeeding the ratification of the Strategic Defence Package along with the acquisition of the Boeing aircrafts by the South African Airways (DTI, 2008).Through trades deals to the government, obligors backed majority of the NIPP obligations. South Africa attracts high level of investment through the effort of NIPP obligations. The focus of NIPP is value adding, and it has a variety of projects through several strategic segments and sites (DTI, 2008).

2.5 Chapter summary

The South African government has brought changes to the economy of South Africa since 1994. The government came with strategies such as the RDP, GEAR, ASGISA, JIPSA and NDP with the aim of improving the economy of the country and thereby increasing investment. Incentives by the government to encourage investment for both foreign and domestic investors

were made available. The following chapter discusses the theories of investment and the existing empirical studies of investment.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter provides both the theoretical and empirical literature on private investment in South Africa. Section 3.2 reviews some of the theories of investment, section 3.3 discusses empirical literature and is categorised as follows: developed countries, developing countries and the empirical literature on South Africa. Section 3.4 provides a brief conclusion of the chapter.

3.2 Theoretical considerations

There are a number of theories that have been developed on investment. However, the following theories are relevant to this study; the accelerator theory, neoclassical theory, Tobin Q and the cash flow theory of investment.

3.2.1 Accelerator Theory

As indicated in the introduction section, economic growth is a major concern in South Africa. Its choice as one of the determinants of investment decision is based on Acceleration model. Parker (2009) declares that among the earliest empirical investment models was the acceleration principle, or accelerator, while Lund (1979) states that the origin of the acceleration principle was coined by Clark (1917). Baddley (2002) agrees with Lund (1979) that the first person to investigate the relationship between investment and output growth was Clark. Acceleration model focuses on output growth (GDP) as the determinant of investment decision. This implies that capital stock reaches its desired level in each period of time disregarding the lengthy term prospects (Gezici, 2007).

Lund (1979) came up with the following assumptions of acceleration principle: The first assumption of the accelerator theory is that at any moment of time and for every level of production, there is an invariant option method of production. Secondly, firms combine capital and labour in exactly the same proportion, irrespective of the prevailing levels of wage rates and interest rates, hence they have fixed optimum capital/ output and labour/output ratio. The proportions in which different types of products are produced are similarly invariant. The last assumption is that firms are not deterred from expanding their capital equipment by any

shortage of available funds. In each time period, a firm undertakes sufficient investment to adequate its capital stock with that which is optimum for the current level of production. This assumption by lund (1979) implies that;

$$\boldsymbol{K_t = vY_t} \qquad 3.1$$

$$\boldsymbol{K_{t-1} = vY_{t-1}} \qquad 3.2$$

where,

$\boldsymbol{K_t}$ stands for the capital stock

$\boldsymbol{Y_t}$ for the level of output or income, and

v for capital - output ratio

Therefore, the increase in stock of capital in period t is given by the following equation:

$$\boldsymbol{K_t - vY_t = K_{t-1} - vY_{t-1}}$$

$$\boldsymbol{K_t - K_{t-1} = vY_t - vY_{t-1}} \qquad 3.3$$

Since increase in the stock of capital in a year ($\boldsymbol{K_t - K_{t-1}}$) represents investment in that year, the above equation (3) can be written as bellow:

$$\boldsymbol{K_t - K_{t-1} = v(Y_t - Y_{t-1})} \qquad 3.4$$

Equation (4) states that net investment is a function of the rate of change of output.

The simple accelerator theory emphasizes that the connection among the preferred capital stock and the predictable production stays the same (Valadkhani, 2004). Baddeley (2002) acknowledges the accelerator theory to have superior explanatory power in comparison with Jorgen's neoclassical accelerator theory. But there are a number of empirical problems with the estimation of accelerator theory and the apparently superior explanatory power is not convincing as a complete explanation for investment. In accelerator theory, expectations are essentially static, the direction of causality is not established and lags are often introduced in an ad hoc way.

3.2.2 The neoclassical theory of investment (NTI)

According to Gordon (1992), the neoclassical theory of investment (NTI) equates the marginal rate of investment return with interest rate. Prior to Keynes, the NTI was based on the assumption that the future is certain, in which case the interest rate is the risk-free rate. From this point of view, this demonstrates the fact that neoclassical theory of investment is a cornerstone of the microeconomic foundation of neoclassical macroeconomics. In addition, it may well be argued that in neoclassical macroeconomics, output is a function of employment given that the capital stock and output growth is determined in the capital market by the interest rate.

The view that output growth is determined by interest rate contrasts with the view of O'sullivan and Sheffrin (2006) which opines that firms need to take other factors into account besides interest rates in making their investment decisions. However, the neoclassical theory of investment pioneered by Jorgenson and Stephenson (1969) demonstrates the fact that taxes and real interest rates are keys in determining investment spending. Jorgenson's theory was to investigate how investors respond to a variety of tax incentives, including investment tax credits.

3.2.3 Tobin Q

According to Parker (2009), Tobin q theory of investment based on financial markets was formulated by Tobin (1969), another Nobel Prize winner. Tobin argued that firms' investment level should depend on the ratio of the present value of installed capital to the replacement cost of capital. This ratio is Tobin's q. The q theory of investment argues that firms will want to increase their capital when $q > 1$ and decrease their capital stock when $q < 1$. If $q > 1$, a firm can buy one dollar's worth of capital (at replacement cost) and earn profits that have present value in excess of one dollar''(Parker, 2009:17).

The ratio of market value of business capital to asset and their value of replacement is affected by the net investment. The q model offers a demanding outline for stating the outcome of the market value of investment (Humavindu, 2002). Chirinko (1993) concurs with Humavindu (2002) that in the Tobin Q theory of investment, the ratio of the market value of the existing capital stock to its replacement cost (the Q ratio) is the main force driving investment. Therefore, enterprises will want to invest if the increase in the market value of an additional unit exceeds the replacement cost.

Several theories exist on profits that is earned by the units in the business and industries in place of output. There are various variants in the profit and investment analysis of the business, which includes current profit has impact on the investment, the value of the retained income or output variables, price and sales that disclose earnings (Chirinko, 1993).

As Tobin argued, increase in the return to capital will raise the market value of additional investment. Additional investment will drive down the marginal product of capital, reducing the asset price of capital goods until equilibrium is restored (Summers, 1981).

Two reasons provided by Tobin to explain why Q may vary from unity are: distribution delays and the marginal cost of investment are increased. Though, the q theory has been criticised for chosen it application based of a particular purpose. The q theory does not talk about aspects that manage distribution lag requirement length and shape. Practically, many problems exist that include measuring marginal instead of average user capital cost. Indicating intangibles that disturb market value and integrating tax elements (Humavindu, 2002)

According to Mc Donald (2005), the q theory focuses on profit maximising businesses returns on minimal unit of real investment. Some standard assumption in the theory of investment is that additional capital instalment have a cost. The minimal change in price is presumed to rise with the extent of the alteration. The firm maximises the discount worth of profits subject to the constraints in stages in which, capital stock in the following stage equivalent to the capital stock in the present stage together with the amount of actual investment embark on. The q theory indicates one of the positive function of q is investment.

The reduced value of expected basics falls in a case where there is a rise in interest rates. All things being equal, Interest rates and share prices have opposite relationship. Therefore if interest rates rise, it will reduce the numerator of the q equation. This will occur instantly as stock markets alter immediately to the changes in the interest rate. Greater interest rates will reduce q and cause a lower anticipated K* (Stevens 2005).

3.2.4 Cash flow theory

According to Summers (1984), the cash flow theory of investment was developed by Jensen (1986). The behaviour in investment in a cash flow prototypes rest on the internal cash flow, as these monies are the outstanding and the utmost suitable of funding for firms fixed investment; the cash flow model have been criticised for its role. Does the optimal capital

stock impacted directly by the cash flow or its influence the adjustment speed from the present capital stock to optimal capital stock? Lastly the Autoregressive or time series prototypes are seen as typical samples of the measurement without a concept. Investment could be explained in the simplest way by the use of previous investment expenditure. The effect of changes in the business conditions or economic policy does not relate directly to Autoregressive prototypes. Consequently, this type of models could have a sub-optimal relation to structural models (Humavindu, 2002).

3.3 Empirical Literature

The empirical evidence indicates that the importance of the determinants of private fixed investment differ from each country, from developed countries to developing countries. This section concentrates on how different authors analyse the literature of private fixed investment and other related literature in developed countries, developing countries and South Africa as follows.

3.3.1 Literature from developed countries

The Foreign Direct Investment (FDI) and domestic investment in industrialised nations can be grouped into two components as seen from the literature observation. According to Al-Sadig (2013), the FDI utilise accumulated macro-level data, as opposed to domestic investment that utilise firms' data levels. The outcomes by equally these elements are indecisive. Most investigation reveals external FDI decreases a nation's domestic rate of investment, though some discover that the external FDI rouses local investment, and others sees no impact (Al-Sadig, 2013).

Landon and Smith (2007) estimated that the collective and sector-level investment calculations which integrate the rate of exchange for a panel data of 17 OECD nations by means of an error correction method. The researchers' study provides an examination of factors of investment in nine separate sectors which incorporate the entire economy. It also provides estimates for equally the short run and long run effects of the exchange rate. The authors found that currency depreciation has an important adverse effect on combined investment in equally short and long course. Furthermore, the consequences of devaluation on investment in the short-run is destructive in all subdivisions and substantial in the bulk part of the segments. Nevertheless, Foreign Capital investment also have a positive impact in the developed nations.

According to a research conducted by Lokesha and Leelavathy (2012), Foreign Direct Investment (FDI) has been instrumental in monetary development of created nations. Verging on that each created nation has had the assistance of outside money to supplement its own particular pitiful funds amid the early phases of its improvement.

Nucci and Pozzolo (2001) investigated the connection among the rate of exchange fluctuation and the investment choices of manufacturing firms in Italy, the study employed firm-level panel data. The researchers' findings also confirm that the major consequences of the hypothetical model: a devaluation of the rate of exchange influences investment through the revenue channel and a negative effect through the cost channel positively. Furthermore, the authors found that the decisions on investment by firms with minor monopoly control are more reflective to the rate of exchange disparities.

According to Nucci and Pozzolo (2001), the reliability of firms on the imported input will lead to a variable cost upsurge and the reduction marginal worth of capital. Investment level reduction would be amplified, when exchange rate is depreciated.

Caselli, Pagano and Schivardi (2002) studied the method of formation of capital by the large European markets. The authors used the OECD's International Sectoral Database to estimate a neoclassical investment calculation at segmental level. The results indicated that there was a capital formation slowdown. In the nineties the slowdown is clarified by the analysis in structural connection among demand and investment. The response of investment to demand was lower compared to years ago. Furthermore, the authors find that a drop in accelerator can be attributed to a greater demand uncertainty. Moreover, the study shows that the connection among undertaking and indecision can be discovered at sectoral level.

Byrne and Davis (2005) focused on the connection among investment and uncertainty in the Group 7[1] (G7) countries, using quarterly time series data. The study conducted in different nation's investigation into investment, together with a broad series of macroeconomic pointers of doubt. The authors assessed the lengthy time impact on investment, actions of restricted instability and short period dynamic influence of doubt proxies on investment. Additional

[1] A group of countries consisting of finance ministers and central bank governors of seven major advance economies as reported by the International Monetary Fund, which is Canada, Italy, France, United State, United Kingdom, Germany and Japan.

consideration of attention was giving to study if the extended run nation similarity is recognised by the data.

The results indicated that the long run elasticity was constantly important and the projected coefficients were marginally higher than one in degree. In the discrepancy of equity prices, manufacturing output and price rises, there was frequently adverse consequence emanating from doubt in these variables, though no evidence was found that was statistical significant across the G7 (Byrne and Davis 2004).

The influence of production and the rate of exchange instability on private fixed investment from list of nations namely, Canada, Germany, United States and United Kingdom all under the G7 was investigated by Chowdhury and Wheeler (2015). The study employed the quarterly data from 1972q1-2011q2, a significant public strategy repercussions with regard to the impact of volatility on private fixed investment was evident in the study outcome. The vector autoregressive (VAR) models was used in the analysis. The (VAR) models that was used contain the price level, real output, the instability of real production, the real rate of exchange, the instability of the real exchange rate, an interest rate and the private fixed investment. According to Chowdhury and Wheeler (2015), the important part of the prediction inaccuracy change in private fixed investment in some nation was explained by neither the output nor rate of exchange instability.

Butzen, Fuss and Vermeulen (2002) examined exactly how output doubt demand and interrupt investment activities for a panel of manufacturing businesses in Belgium. The researchers used the amount of investment plans instead of realised investment data. Furthermore, they estimated three different specifications in order to find robust predictions: Error correction method, Euler equation and variant of specification.

The authors found that uncertainty depresses investment in the industry and firm. They also found out that industry and firm specific uncertainty do not affect investment plans. Furthermore in the Euler equation the sector price was significant for the spring and autumn survey. However, demand uncertainty is significant in the spring survey. The results also indicate that increased uncertainty induces firms to postpone investing now in favour of the future. This result confirms predictions of the real option theory.

There are important variables that show the amount of investment demand and their comparative importance during the period 1960 – 2000 in the United State of America (USA)

that was identified by Heim (2008). Variables that could be the elements of investment demand widely controlled the effects of other possible factors that might alter results was tested in the study. A review of the investment literature indicates that considerable amount of variables had sporadically been deliberated as likely factors of the amount of cumulative investment in the USA. However, the author identified eight determinants: prospects about the imminent lucrativeness of the present investment, the degree of which the present output was used, the rate of interest, profitability of current investment, stock market, the amount of devaluation grants accessible to a business, exchange rate and the extent to which government deficits create a crowd out problem.

Baum, Caglayan and Talavera (2007) studied determinants of firms' investment in the USA. The investigators employed data of time series for the 1984 to 2003 period to determine the effect of three forms of firms' investment behaviour, that is, own uncertainty, market uncertainty and the relation amongst inherent as well as extrinsic doubt. The authors also introduced a covariance term the CAPM and permit data to define discrepancy influence of the firms' components. They employ Merton methodology to compute inherent as well as extrinsic doubt.

In contrast to other researchers, the authors found that in the model that includes Q, indecision is functioning affects investment negatively. The CAPM founded doubt also indicates an adverse impact on investment, while market indecision has a constructive influence. The researchers stated that the properties of doubt on investment may be profound to model requirement, sample selected and plan of doubt proxies.

Shinada (2007) used Japanese panel data from 1986 to 2004 to demonstrate the relationship between uncertainty of productive growth and investment in Japan. The author suggests doubt takes an adverse impact on production planning, investment, research and development. The aim of the study was to explain how uncertainty affects the economy by concentrating on examination of the connection among the corporate fixed investment in Japanese and growth about uncertainty and construction of quantitative measures indicating uncertainty. The investigation examined the connection among and investment and uncertainty.

The study outcomes indicated that an average q and minimal q are confirmed as an important variables to describe investment. Greater uncertainty in output growth has an undesirable consequence on investment and the adverse influence is deteriorated when a business fits into an industry that have significantly likely demand progress. The later stages in the 1990s, greater

uncertainty concerning the movement of high-tech boundary have a comparatively greater adverse consequence on investment, particularly in industries. The study demonstrates that uncertainty is one of the factors that weaken private fixed investment in Japan during the last decade after the bubble collapse (Shinada, 2007).

Shinada (2007) further suggested policy implications in which government takes actions that encourage private fixed investment by identical backing by all businesses, for example, altering devaluation guidelines, reforms in the taxing system, and also inspiring market rivalry with the use of extremely industrious companies. Businesses are expected to create suitable risk assessment and controlling structures which will reduce the adverse result of growing uncertainty on investment and effectively investing in prospect ventures.

Although there was a positive impact of private investment on economic wealth, evidence suggests that there was substantial difference that exist in the relative amounts raised and invested across developed as well as developing countries. Countries such as the US and the UK have a strong market for private investment class, while Japan has a lower level (Bernoth and Colavencchio, 2014). From these views, the shortcomings can be enhanced to develop the knowledge base of this area of investment economics. Furthermore, the strengths can be further enhanced to build better frameworks of decision making. These are what the study aims to achieve as spin-offs.

3.3.2 Literature from Developing countries

Mallick (2012), investigated private investment in Information and Communication Technology (ICT) sector of Indian states and explored the determinants using panel regression methods covering the period from 1999-2000 to 2004-2005. According to Mallick (2012), the state wealth in the following items; ICT- sector specific infrastructure per capita income, physical infrastructure, human resource and labour productivity may determine the inflow of private investment inflow to the economy.

A research conducted by Acosta and Loza (2005) affords experimental investigation in the macroeconomic determinants of private investment that can potentially influence investment choice in Argentina in the short, moderate and extensive run perception. According to Acosta and Loza (2005), the debt position of the country with the rest of the world entirely influences the outlooks of investors and could regulates the existence of the fiscal strategies undertaking by the government. In the short run, there is a prediction that assumes that the reliance and

movements of private investment would come back to the nation, so far as fiscal growth and outlook of sustainability in time also return.

A research conducted by Bint-e-Ajaz and Ellahi (2012), indicated that there has been little accessible fiscal models that gives a restricted awareness into the applied difficulties fronting emerging world; concerning private fixed investment. Although a heated debate on economic models have come up in making of policy and educational spheres concerning the part that could be played by the public and private investment in the course of fiscal development has been intensified over a number of years. From Keynesian to Harrod-Domar, the only one-sector major macro models of the day, appeared to take comparatively slight importance for emerging communities. In general, it was indicated by the authors that market conditions have a positive impact on private investment; on the other hand changes in output have minor impact.

The impact of GDP growth on private and public investment is positive in relations. The level of inflation, exchange rates and GDP has impact on public investment, exchange rate, inflation, and lending rates apart from GDP level affect private investment (Bint-e Ajaz and Ellahi, 2012). The researchers stated that public investment for the past years financed by external and internal borrowings and exert crowding out influence on private investment at large.

According to a research conducted by Lokesha and Leelavathy (2012) in India, it was discovered that some of significant factors of FDI are the size of the market, earnings for the population, market size and GDP growth. Researchers also indicated that extra firms, either domestic or foreign could be housed in the markets that are big. This could assist in creating produce that could be traded to attain balance and latitude. An investment increase, due to the high growth rate attract firms in the market.

Exchange rate policies increases the exports and produce import replacement procedure. In the long run, though, it does not appear to be a good replacement for an accountable strategy in public finance, an enhancement of the environment in business, an end to unexpected declines concerning fiscal strategies, and a retrieval of the trust in the local financial establishments (Lokesha and Leelavathy, 2012). These appear to be the solutions to unlock a good circle of development that will assist the nation to improve previous levels of improvement and wealth.

Green and Villanueva (1991) examined experimental factors of private investments activity in 23 emerging nations during the post 1974 period, from 1975 to 1987. The study provides a preliminary look at how macroeconomic factors have affected private investment in developing

countries. Further to this, the study examines the following factors: economic growth and per capita income level, macroeconomic stability, the level of interest rate, the size of debt-service burdens and the rate of public sector investment.

The authors claim that because of the difficulty in identifying a correct theoretical specification and obtaining data the study does not attempt to build and estimate a full scale structural model. It was rather an explanatory data analysis. The results may be used in identifying a more fundamental relationship between private sector investment and macroeconomic variables which can be used to develop an appropriate model of investment behaviour in developing countries (Green & Villanueva, 1991).

According to Asteriou and Price (2000), the interaction among investment, economic growth and uncertainty. The investigation employed a section data for a sample of 59 manufacturing and emerging nations between 1966 and 1992. It was revealed by the authors that uncertainty decreases equally investment and growth. The researchers' outcomes also exposed the use of orthodox section methods in dynamic models categorised by heterogeneity can be extremely deceptive.

The influence of real exchange rate uncertainty on combined private investment was examined by Pradhan, Schuster and Upadhyaya (2004). The investigation engaged yearly period series data from 1972 - 2000 for four emerging nations namely Indonesia, Thailand, Malaysia, and the Philippines all these nations were in the South-east Asia. By using the augmented Dickey-fuller and Phillips-Perron test, the stationarity in the data sequence were tested for, and the connection among investment and uncertainty of each country is examined separately.

The outcome showed that in Thailand, the rate of exchange instability brings an adverse coefficient however, statistically important for Thailand alone. The indecision of profits owed to the instability of real exchange decreases private investment; dissimilarity to Malaysia whereby the rate of exchange appears to have a positive and important outcome. Regarding the Philippines, the concurrent result is optimistic nevertheless the lagged outcome is undesirable and important (Pradhan *et a*.l, 2004).

Harris, Nguyen and Scaramozzino (2006) reported guesses of uncertainty's outcome on private domestic investment by means of business-level data for 283 firms over nine years 1994-2002 for Thailand. High growth for a decade following 1986 was experienced by the country, disturbed by a recession and recovery after the1997 crises in the East Asia. Investment by

private businesses have significant part in those variations. The high rates of private investment happened beneath a policy system that assured implied promises of macroeconomic steadiness. The outcomes of the study established healthy confirmation of an adverse connection among private domestic investment and uncertainty. Moreover, the investigators established the influence of uncertainty is linked to procedures of investment irrevocable, thus borrowing backed the awareness that a companies' actions toe the line to the actual choices model of investment under uncertainty.

The confirmation from registered businesses in the Thailand recommended an important adverse connection occurs among investment and uncertainty. The healthiness of the discovering the connection rest upon the degree of investment, irreversibility provides help to the idea that businesses' investment choices are impacted by the worth of the choice to delay. Resilient new assessments of the factors of investment in Thailand, the outcomes augment to the limited surviving business-level investment investigation for emerging nations (Harris *et al.*, 2006).

Ang (2009) observed the role of financial sector policies in determining private investment in the economies of India and Malaysia. Private investment is the main catalyst for generating long run growth in developing countries. The response of private investment to financial sector policies has received little attention in the analysis of investment behaviour. This study is related to literature strands that explored determinants of private investment for developing countries. The study used time series data covering the period from 1950 to 2005 for India and from 1959 to 2005 for Malaysia in empirical analysis.

Gui-Diby (2014) investigated nations during 1980 -2009, using two sets of approach to determine the impact of foreign direct investments on fiscal growth in 50 Africa countries. A Specific methods used for panel data was utilized for the first set. Whereas cross-section data with approaches such as ordinary least squares (OLS), seemingly unrelated regressions (SUR) and cointegration, including country-by-country analysis was used for the second set. Between these methods, the FDI influence on fiscal growth is examined, whether there is a conditions or restrictions. Outcomes by Gui-Diby (2014) exposed that inflows of FDI concerning countries in Africa have impacted significantly on the growth of their economy for the previous years. Although the influence remained diverse through the whole period. At the beginning of 1980 to 1994, FDI impact on economic development was negative whereas between 1995 and 2009 it had a positive effect. The variance in this event shows that the applications in many

African nations of operational alteration plans, comprising of denationalisation, FDI orientation in supply pursuing events, fragile fiscal relations among international businesses and domestic companies, and the low volume of domestic initiatives to assemble sufficient means to inaugurate output remained the key issue (Gui-Diby, 2014). Contrary, the business environment enhancement and the role of resource-based businesses towards fiscal development owed to the outflow of produces caused in the optimistic influence between 1995 and 2009.

The recommendation from the researcher suggests that policy makers should design policies that would attract foreign investors. On the issue of human capital, the researcher also indicated that government should make and develop accessibility to sound skilled labor force that would impact positively on implementation of FDI policies on the growth of the economy to maximise the benefits from the FDI.

The study conducted by Al-Sadig (2013) examined the impact of external FDI in emerging nations by means of data from 121 emerging and evolution markets over the period 1990–2010 on local investment. Three different methods namely Generalised Method of Moments (GMM) estimators, Pooled OLS (POLS), Within Groups (WG) and first-differenced was engaged in the study.

The effect of FDI leakages on the local investment, according to Al-Sadig (2013), might happen through product and financial markets. Beneath the defective monetary market condition FDI outflows may increase local interest rates by funds outflow from the home country which would make it hard for domestic firms to borrow. The researcher also indicated that the domestic exports may reduce by firms that want to invest in foreign countries, by transporting their production abroad. FDI may have a positive, negative or neutral impact on the domestic economy of the home country's investment rate, this effects would be evident through experimental exercise (Al-Sadig 2013). FDI outflow may be seen as complement to local investment, if outflows of FDI supplement the homebased exports through regressive and onward manufacturing connections in the home country.

An outward FDI reduces home country domestic investment according to empirical findings by Al-Sadig (2013). An FDI outflow percentage increase in the local nation leads to the reduction in local investment around 29 percent of GDP. The researcher further demonstrates that the host countries local investment is crowded by FDI inflow. The local investment increases to 55 percent when there is a percentage increase in FDI inflows.

Guimaraes and Unteroberdoerster (2006) used combined and business-level data, to clarify the trends of investment and their repercussions on investment and growth stance in Malaysia. Subsequently, increasing gradually between 1987 and 1997 above 30 percent of the GDP, investment by private sectors fell and simply started a steady improvement in 2004 at around 10 percent of the GDP in 2005. Firm-level data is also employed to shed light on the role of corporate profitability, possible constraints in financing, also to evaluate dissimilarities of conduct across sectors in the economy regarding investment.

The results pointed out that the amount of private investment in Malaysia has been closely connected to real GDP, in the long run. Nevertheless, indication revealed that there is continued over-investment, particularly in the property sector, in the years leading to the Asian crisis. Moreover the conditions of the macroeconomic, perceptions shift by investors' that might activated via the crisis situation or a lengthy above-investment, seems to have added to the speed deterioration in private investment in the modern period. The profitability level for the businesses remained the key factor of Malaysia investment through all segments. Whereas business magnitude is normally concerned, other reasons, particularly funding restrictions, appears to influence investment, precisely aimed at minor companies and the businesses in the services area (Guimaraes *et al.*, 2006).

The long-term trends examination indicates a return to pre-crisis investment point appears neither needed nor essential for safeguarding Malaysia's prospects of growth (Guimaraes *et al*, 2006).

Surajit's (2008) investigation used annual data from Bombay Stock Exchange Official Directory in India of listed manufacturing firms. The researcher tried to understand the experimental elements of India private corporate investment action after the liberalisation era. The purpose of the investigation was to scrutinise the part played by the accelerators and financial variables impacting on the industry permanent investment and attempt to separate their individual significance. The author found that there was a significant support of investment and accelerator affiliation. Inner liquidity is significant than profitability to company's decisions regarding investment The author also found evidence that credit worthiness is important for firm's investment decision.

Nair (2005) used annual survey data to assess the connection among investment together with its factors in Indian Private Corporate Manufacturing Sector (IPCMS) in the era of 1973 to 2000. The investigation established that in emerging nations economic policy is more crucial

than traditional factors in determining investment behaviour. Private investment plays a greater role than public investment in determining economic growth. In 1991 a liberal financial regime replaced the old controlled regime. As part of the structural adjustment and macroeconomic stabilisation activities, India implemented several microeconomic, financial sector and trade regulations.

Nair (2005) further established that the determinants by traditional play a critical role in determining investment. The outcomes indicates that investment reaction is more with production plus profit other than the financial variables of the liberalisation policy. Financial liberalisation made an atmosphere favourable for investment although the situation might not succeeded in making continued growth in the formation of capital in post modification. The research provides a suggestion on impact of main rule changes that happened in India on corporate investment, while these are initial, and needs to be analysed further.

Ahmad and Qayyum (2008) provided assessments on the conduct of the private investment of big scale industries in the era of 1972 - 2005 in Pakistan. In 1971 a nationalisation policy was adopted and the result was a sharp fall of private investment, but investment by the public doubled. The dawn of 70's nationalisation was gradually reversed, and private investment showed an optimistic movement. This led to a favourable impact on the investor's confidence.

Ahmad and Qayyum (2008) applied the Johansen cointegration approach. Their results indicate the existence of lengthy period connection between private fixed investment, public consumption expenditures, big manufacturing, public expansion spending's and market size. The examination too discloses favourable extended run connection among private fixed investment in a vast industries and expenditure for public expansion. Community expansion disbursements on structures, gas, transport, electricity, and communication rises the return to investment. Therefore increase the private fixed investment profitability in the service sector. Result from the research substantiate the suggestion that expenditure for public development enhance investment by private sector in big scale manufacturing and non-development expenditure for public take a substantial adverse influence on private investment.

Investigation by Ahmad and Qayyum (2008) on how spending by the Pakistani's government for the period 1972 to 2005 and uncertainty of macroeconomic on private fixed investment in the service sector; Time series properties of data then projected long run model by means of the cointegration technique was first investigated by the researchers. The outcomes showed that consumption by the government in the long run could originate rising force on rate of

interest that applies an adverse consequence on the investment by the private sector in the service segment. The expenditure by the government has a robust effect on private investment area of services sector as against the combined private investment function. Examination too specified that an adverse long run connection among private investment in services and rate of interest. This suggests among others that there is a reduction in the rate of interest generate a suitable economic environment that stimulate private sector to participate in the service area by decreasing private sector's cost of production and later increases the productivity of the private fixed investment in this area. A short run Variations in the rate of interest disturb private investment in service (Ahmad and Qayyum 2008).

According to Ahmad and Qayyum (2008) a point of high macroeconomic steadiness and expectable rates of inflation devise a vital significance to safeguard a robust account of investment by the private sector to economic events. Policy on interest rates should be outlined bearing in mind the atmosphere of the investment conditions and directed segment in the economy so as to encouraged private investment activities.

Using the standard time series econometric analysis, Hassan and Salim (2011), examined Bangladesh's factors of private investment. According to Hassan and Salim (2011), the impact of investment in the private sector positively disturbed by the domestic output and external debt. The following factors also affect private sector investment negatively, terms of trade, real interest rate, and the government expenditure. Though, the rate of real interest coefficients and the terms of trade are not important statistically; however, the size of these coefficients are very small. The private investment is affected by the national output significantly. While interest rate is not. This shows that the research experimental findings support the neoclassical flexible accelerator hypothesis partially (Hassan and Salim, 2011). The policy implication of the findings are not straightforward as suggested that the expenditures by government crowd-out investment by the private sector as it was shown in the research. Though interest is not investment responsive, the crowding-out effect might be a minor. Consequently government should have little influence on institutional outline over efficient regulation positions and generate friendly investment atmosphere in the country. Spending's by the Government could likewise be used to influence the economic production positively if the economy experienced a recession (Hassan and Salim, 2011); as a monetary policy of the economy is not expected to impact investment positively by reducing interest rate.

Valadkhani (2004) examined the short-run and long-run factor roles of private sector by engaging the Johansen cointegration technique and the short-run dynamic model in Iran. Moreover, the time-series data for the period 1960- 2000 was used in this investigation. Valadkhani (2004) claimed that the yearly share average of investment by the private sector in GDP has not changed meaningfully between 1959 to 1979 and the era of 1980 to 2000; and the private sector share of investment remained higher always than that of government sector owing to a substantial decrease in the oil exports.

The result indicated that investment by private sector has a positive relation to non-oil GDP an opposite one-to-one connection among inflation and private investment also existed. This shows that an increase of 10 percent in inflation could decrease investment by the private sector by the same degree. This supports assessment that higher rate of inflation discourage investors to obtain genuine possessions (Valadkhani, 2004).

Lensink and Sterken (1998) stated that in the 1991, the Czech Republic reformed local economy into a market economy. The improvement plan was branded by packed consumer liberalisation and producer prices, a substantial reduction in subsidies by the government, the trade liberalisation, radical devaluation of the national currency, and a quick denationalisation plan for businesses. The researchers examined investment by private manufacturing businesses in the Czech Republic in the years 1992 to 1996. The study further focuses on the effects of uncertainty on investment. Present estimation of cross-section outcomes in an accelerator model by means of 1284 sample of businesses. According to Lensink and Sterken (1998), the following complications impede assessment: part of the data could be untrustworthy and the position of businesses could be altered in the illustration period.

The main interest of the authors' in this two components of current perceptions in the investment literature was; they firstly include a substitution for capital market deficiencies. Secondly, it revealed the confusing between investment-uncertainty relationships. The threat adoring businesses are definitely influenced by uncertainty. The authors found indication of cash-flow impact on corporate investment in Czech, privatised firms that are lesser longer face moderately a lesser amount of cash flow limitations. Structures of Finances is not important as much as anticipated. The investigators also established that minor companies respond confidently to uncertainty, though proxies for uncertainty seem to be artificial.

Jayaraman (1996) studied the essential macroeconomic components environment of in SPDMC using time series of six countries. The objectives of study were to empirically

investigate main factors of macroeconomic affecting private investment in pacific south and examine trends in private investment from 1983 to 1990.

The trends showed total domestic ratio of investment to GDP has been generally on the rise except for Fiji. Time series analysis indicates real exchange rate uncertainty has an ample negative consequence on private investment. Growth in output has an expansionary effect on private sector. Public investment has been more complementary and thus it has had a crowding out consequence on investment by the private sector. The policy implication in the SPDMC suggests that the annual fiscal imbalances should be reduced and the rising recurrent expenditure be kept under control. The Bank's operational strategy for SPDMC indicated the significance of private sector's role in future growth of the Islands. The role of the public sector must be limited to performing essential regulating functions as well as supportive services (Jayaraman, 1996).

Acosta and Loza (2005) provided an empirical time series analysis of Argentina's short, medium and long run outlook of possible macroeconomic features that might have influence on the investment decision. They estimated that investment function of private, not merely for a short run, but also for the medium and long run. The study deals with the determinants of private investment. The authors identified the following determinants: activity level, the return rate of the investment, rate of inflation as a realistic proxy for indecision, exterior level of debt, rate of real exchange and the magnitude of the liberalisation of trade.

Humavindu (2002) investigated the determinants of combined Namibia's fixed investment inside the Cointegrated Vector Auto regressive System Framework. According to Humavindu (2002), the investment effect could be examined in dual means, that is, the supply side and the demand side. The author also explores Namibia's short run and long run coefficient of private fixed investment, by means of annual observations sample among 1982 and 1999. A vital outcome indicated that Namibia's productivity is not significant. These findings warrant a further investigation. The author also finds that investment tends of government investment crowd out investment by the private sector in short and long run.

The policy implication is that the government investment ratio and rate of interest disparities are the main factors of Namibia private investments. Importance could be giving to the two variables in determination to stimulate and improve the Namibia's private investment. (Humavindu, 2002).

3.3.3 Literature from South Africa

Ndikumana (2005) explored the factors of investment by means of both combined industry-level data and disaggregated data on subdivisions of 27 of manufacturing for the era of 1970 to 2001.The study explored factors of investment with special importance on the part played by the factors that are connected to macroeconomic strategy. The author employed econometric analysis using a mixture of models drawn from neoclassical and Keynesian traditions to offer quantitative proof that might explain the strategies for increasing investment by the private sector as the nation pursue methods to increase the GDP trend of progression and speed up work creation. Since 1970 the capital accumulation rate has dropped. Data indicated that private investment exhibits a slow but steady recovery. Public investment has systematically declined from 11, 5 percent in 1976 to 5 percent in 2004.

The author also found that the rate of real interest as well as rate of nominal interest have an adverse and important consequence on investment. The outcomes exhibited that huge effective rate of corporate tax can hinder private investment. It also established that upper profitability arouses investment by the private sector to the degree that strategy could rise profits of firms, and would rise investments. An investigation results Nikuman (2005) showed thatgovernmen local borrowing has an adverse influence on investment. The results cast uncertainty on assertions that public investment might take crowded out private investment. Instead they propose that government can encourage an investment changeover by raising its expenditure on infrastructure

Kumo (2006) investigated time effects changing indecision on combined on South Africa private fixed investment by means of time series data between 1975 and 2003. The author employed Generalised Autogressive Conditional Heteroskedasticity (GARCH) produced instability procedures of five diverse variables of macroeconomic as a measure of doubt. Furthermore, the author design the connection among investment factors in error correction model; that allowed the author to investigate the influence of macroeconomic uncertainty, the author employed a model of capital stock.

The results suggested that uncertainty about macroeconomic has an important adverse effect on the combined private fixed investment. However, the influence is substantial as well as huge on GDP and the rate of real effective exchange. The magnitude of the impact in GDP is lower than the rate of real effective exchange. Uncertainty on trade terms positively and marginally

have substantial effect; Rate of real interest did not have an important influence. The author further argued that the results do not support accelerator and neoclassical theories (Kumo 2006).

Luca and Spatafora (2012) examined determinants of, and inter-connection among, the inflows of capital, development in finances, and local investment in emerging nations throughout 2001 to 2007. An extraordinary worsened global conditions in terms of monetary value that resulted in fast decrease in the interest rates that spreads in most emerging states was witnessed in this period (Luca and Spatafora, 2012). These conditions also happened together with quick upsurge in local credit, financial inflows and capital-market assessments among the developing sphere. The confidence in the underlying relationship could be unfold as a result of large exogenous financial shocks.

According to Luca and Spatafora (2012), panel techniques and cross-sectional recommend a decrease in the globally price risk and domestic borrowing cost, they were the key backers for the increase of net capital entries and local credit above a certain era. The differences in the cross-country among the global and local finances are huge, and could be explained clearly by the essential issues like right to international export markets, institutional quality, and appropriate policy on macroeconomic (Luca and Spatafora, 2012). The researcher further stated that net inflow of capital coupled with domestic credit have a positive impact on investment. The inflows of net capital and local credit have impact global price of risk and cost of borrowing domestically. Surprisingly, both large institutional quality and greater domestic credit have a positive impact to what degree to which inflow of capital into domestic investment.

Fielding (1999) presented empirical model of investment and uses macroeconomic and sectoral data from South African manufacturing for the period 1960 -1993. Furthermore, the author argues that there is a demanding the necessity for solid proof about the factors of economic development in poor countries. Moreover, the author further claims that little attention has been given to the impact variability in the rate of return and cost of capital. The author claims that the study is grounded in the theoretical framework used by industrialised countries.

An interesting finding is that no evidence was found to suggest that the relaxation of apartheid between 1980 and 1990 had a substantial effect on the data producing procedure for investment. The outcomes recommend that investment is extremely complex to the output level and also

specify the significance of the doubt effect at both the macroeconomic and microeconomic level (Fielding, 1999).

duToit and Moolman (2004) projected, bring out and predicted a model of fixed investment. The authors apply Johnson's cointegration technique to assess if variables are cointegrated. The South Africa gross domestic fixed investment in worsened considerably as a result of the imposition of economic exclusions, disinvestment and outflow of foreign capital since 1985. The inception of the new government resulted in the improvement of the situation. The authors claimed that investment is projected to be steady with a neoclassical supply-side model for the economy of South African. In the neoclassical tradition, the model has to permit for cost minimising or profit maximising processes by companies, wherever factors on the supply-side such as rate of interest, taxes, and funding in the wider logic perform an important role.

The result of investment in the long-run level remained a function of capital change. It is also driven by cost of user capital and the slightly capital output. The results have serious implications to policy makers. The authours have to address user cost of capital to stimulate investment. The importance of South Africa's inner location points to the obligation of policy authorities in sustaining a comprehensive economic basics and rules (du Toit & Moolman, 2004).

3.4 Conclusion

The empirical evidence indicates that the importance of the variables that affect private fixed investment differ from each countries, from developed countries to developing countries. This study employs the following variables: GDP, inflation rate, real interest and general tax rate. The next chapter discusses the methodological approach to analyse connection among the private fixed investment and its determinants and motivates the selection of the selected variables (Real interest rate, GDP, inflation, exchange rate and general tax rate).

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter outlines the methodological approach utilised to analyse the determinants of private fixed investment. The chapter is organised as follow: section 4.2 is the theoretical framework, 4.3 model specification, section 4.4 data description, section 4.4. definition of variables, 4.5 expected sign, 4.6 data sources and description, 4.7 estimation techniques and 4.8 chapter summary.

4.2 Theoretical Framework

The current study follows studies conducted by Akanbi (2013) and Eita and Du Toit (2009), which considered neoclasical theory to be the utmost appropriate method in assessing investment function. The neoclassical theory of investment was initiated by Jorgenson and Stephenson (1969). The theory demonstrated the fact that taxes and real interest rates are keys in determining investment spending. Jorgenson and Stephenson theory investigated how investors respond to a variety of tax incentives, including investment tax credits. According to du Toit and Moolman (2004), the neoclassical theory feature was distighuished based on a clear model of optimisation performance, which relates the anticipated capital stock to rate of interest, capital prices, output, and tax policies.

4.3 Model specification

Theories of investment and empirical studies identify a number of determinants that influence investment. The current private fixed investment model is adopted from the study by Akanbi (2013).

$$Ip_t = f(Y_t, tax\_rate_t, real\_exch_t, rint_t) \quad 4.1$$

Equation 4.1 represents the model formulated by Akanbi (2013), where Ip_t represent private investment, Y_t is the gross domestic product, tax_rate_t is the average tax rate, $real\_exch_t$ is rand/dollar exchange rate and $r\ int_t$ is the real interest rate. This study adopts the model by Akanbi (2013) as it is. The model is presented as follow in equation 4.2.

$$PFINV = f(GDP_t, RINT_t, REER_t, TAX_t, \varepsilon_t) \quad 4.2$$

where:

PFINV = private fixed investment

GDP = gross domestic product

RINT = real interest rate

REER = real effective exchange rate

TAX = general tax rate

ε_t = error term

The linear regression of the model in logarithims is presented as follows:

$$PFINV_t = \alpha_0 + \alpha_1 logGDP_t + \alpha_2 logRINT_t + \alpha_3 logRER_t + \alpha_4 logTAX_t + \varepsilon_t \quad 4.3$$

where:

α_0 = a constant

$\alpha_{1.2.3\ldots n}$ = a coefficients

4.4 Definition of variables

Private Fixed Investment refers to investment in fixed capital or to the replacement of depreciated fixed capital in economics. Spending by private businesses is measured, non-profit organisations, and families fixed assets in the economy. Fixed assets consist of structures, equipment, and software that are used in the production of goods and services (Akkina and Celebi, 2002).

Real interest rate is the rate of interest an investor or creditor receives or expects to receive after permitting for inflation. It can be defined more formally by the Fisher equation, which states that the real interest rate is roughly the nominal interest rate less the rate of inflation (Mishkin, 1992).

Gross Domestic Product refers to the aggregate value of output and services delivered in a country during one year (Egerer, Langmantel, and Zimmer, 2016).

Real exchange rate is defined as the price level of price ratio out of the country and the local price level, where the foreign price level is changed into local currency units via the current nominal rate of exchange (Chinn, 2006).

Tax Rate is the percentage at which a business or individual is taxed. The rate of tax is the tax levied by the central government and some states based on an individual's taxable revenue or a business's earnings (Mendoza, Razin, and Tesar, 1994).

4.5 Expected signs

As illustrated in equation 4.1, PFINV is a dependent variable and GDP, RINT, RER and TAX are independent variables. According to the theory of economics real interest rate, real effective rate and tax rate have negative impact on private fixed investment but gross domestic product has a positive impact on pvivate fixed investment. This is supported by studies by the following researchers: Serven (2003) found that there is a strong negative relationship between real exchange rate and private investment. According to Ahmad and Qayyum (2008), Mlambo and Oshikoya (2001), as well as Akanbi (2013), interest rate and tax rate affect private investment nagetively, because when interest rate increases the return of investment decreases. Findings by Eita and Du Toit (2009) and Akanbi (2013) proved that there is positive relationship between GDP and private investment. The behaviour of these independent variables and their impact on PFINV will be shown by the end results after the regression has been run.

4.6 Data Sources and description

The data used in this study is secondary quarterly time series data from 1994: Q1 to 2015: Q4 obtained from the South African Reserve Bank (SARB). This period is deemed crucial to this study because it marks the transformation of South Africa from the apartheid government to a democratically elected government. The data covers a wide range of macroeconomic variables that include private fixed investment, economic growth which is represented by gross domestic product (GDP), real interest rates, real exchange rate and general tax rate.

4.7 Estimation methods

This study employs the Johansen (1988) technique to test cointergration between private fixed investment and the selected variables. The Johansen permits more than one cointegrating relationship so is more powerful than Engle-Granger two step test which is based on the Augmented Dickey–Fuller (ADF) and Phillips- Perron (PP) tests for unit roots in the residuals from a single cointegrating relationship.

4.7.1 Unit root test

A unit root test is used to determine whether the time series data is stationary or non-stationary. As mentioned, macroeconomic and financial time series data have the characteristics of being non-stationary, therefore, regressing such data leads to spurious results. In order to avoid this problem, the study employs Augmented Dickey-Fuller (ADF), and Philips-Perron (PP) tests which are used to determine the nature of the data. Trend and non-stationarity in time series data is removed by differencing. The ADF and PP tests test the null hypothesis that a variable has a unit root against the alternative hypothesis that there is no unit root. If the variables have a unit root they are likely to benefit from being expressed in first difference form (Studenmund, 2006). The presence of unit root means the trend is non-stationary and if there is no unit roots the trend is stationary. In order to make a proper decision about the nature of the data, this study employs both the informal test (visual inspection) and the formal tests (ADF, PP).

4.7.1.1 Augmented Dickey-Fuller (ADF) test

In statistics and econometrics, according to Gujarati (2012), ADF test is a test for a unit root in time series data. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The ADF statistic, used in the test is a negative number. The more negative it is, the stronger the rejections of the hypothesis that there is a unit root at some level of confidence. The ADF test constructs a parametric correction for higher-order correlation by assuming that the series follows an autoregressive (AR) process and adding lagged difference terms of the dependent variable to the right-hand side of the test regression. If the computed critical value (usually at a chosen level of 1%, 5% and 10% significance) exceeds the computed ADF values, we reject the null hypothesis that the variable has a unit root, in which case the time series is non-stationary.

Said and Dickey (1984) augmented the basic autoregressive unit root test to accommodate general ARMA (p, q) models with unknown orders and their test is what is referred to as the ADF test. It tests the null hypothesis that a time series y_t is $I(1)$ against the alternative which is given by $I(0)$. The test regression of the ADF can be given by

$$y_t = \beta' \mathrm{D}_t + \phi y_{t-1} + \sum_{j=1}^{p} \psi_j \Delta y_{t-j} + \varepsilon_t \qquad 4.4$$

where D_t is a vector of deterministic terms (constant, trend etc.). The specification of the deterministic terms depends on the assumed behavior of y_t under the alternative hypothesis of trend stationarity. When looking at the null hypothesis, y_t is $I(1)$ thereby implying that $\phi = 1$. From the least squares estimates in (3.4), the t-statistic and normalized bias statistic for the ADF can be given by

$$ADF_t = t_{\phi=1} = \frac{\hat{\phi} - 1}{SE(\phi)} \qquad 4.5$$

$$ADF_n = \frac{T(\hat{\phi} - 1)}{1 - \psi_1 - \cdots - \hat{\psi}_p} \qquad 4.6$$

The ADF test regression can also be formulated as

$$\Delta y_t = \beta' D_t + \pi y_{t-1} + \sum_{j=1}^{p} \psi_j \Delta y_{t-1} + \varepsilon_t \qquad 4.7$$

where $\pi = \phi - 1$. $\Delta y_t$is$I(0)$ for the null hypothesis which implies that $\pi = 0$. The *t*-statistic for the ADF is the usual *t*-statistic for testing $\pi = 0$ and the normalized bias statistic for the ADF is $T\hat{\pi}/(1 - \hat{\psi}_1 - \cdots - \hat{\psi}_p)$. In practice, the test regression (4.6) is often used due to the usual t-statistic reported for testing the significance of the coefficienty_{t-1}.

4.7.1.2 Philips-Perron (PP) test

According to Philips and Perron (1988), the benefit of using the PP test is that it is non-parametric which means that it does not require the selection of serial correlation as in the ADF. Another benefit also is that the user do not specify a lag length for the test regression. It instead takes the same estimation scheme as in DF test but corrects the statistic to conduct for autocorrelations and heteroscedasticity. The PP test involves fitting the regression

$$y_t = \alpha + \rho y_{i-1} + \varepsilon_i \qquad 4.8$$

where, a constant can be excluded or a trend term included. There are two statistics Z_p and Z_τ which are calculated as

$$Z_\rho = n(\hat{\rho}_n - 1) - \frac{1}{2}\frac{n^2\hat{\sigma}^2}{s_n^2}\left(\hat{\lambda}_n^2 - \hat{\gamma}_{0,n}\right) \quad 4.9$$

$$Z_\tau = \sqrt{\frac{\hat{\gamma}_{0,n}}{\hat{\lambda}_n^2}}\frac{\hat{\rho}_n - 1}{\hat{\sigma}} - \frac{1}{2}\left(\hat{\lambda}_n^2 - \hat{\gamma}_{0,n}\right)\frac{1}{\hat{\lambda}_n}\frac{n\hat{\sigma}}{s_n} \quad 4.10$$

$$\hat{\gamma}_{j,n} = \frac{1}{n}\sum_{i=j+1}^{n} \hat{u}_i u_{i-j} \quad 4.11$$

$$\hat{\lambda}_n^2 = \hat{\gamma}_{0,n} + 2\sum_{j=1}^{q}\left(1 - \frac{j}{q+1}\right)\hat{\gamma}_{j,n} \quad 4.12$$

$$s_n^2 = \frac{1}{n-k}\sum_{i=1}^{n}(\hat{u}_i^2) \quad 4.13$$

whereu_i is the OLS residual, k is the number of covariates in the regression, q is the number Newey-West lags to use in calculating $\hat{\lambda}_n^2$, and $\hat{\sigma}$ is the OLS standard error of $\hat{\rho}$.

4.7.2 Cointegration

Hjalmarsson and Osterholm (2007) argue that methods of cointegration have been very common apparatus in applied economic work since their introduction. Cointegrationtest is only valid when working with series that are known to be non-stationary. Its tenacity is to define if a group of non-stationary series is cointegrated or not. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a combination exists, the non-stationary time series are said to be cointegrated. There are three methods for testing for cointegration, namely; Johansen, Engle-Granger and Phillips-Ouliaris tests. That been the case this study only employs the Johansen test to test for the long run relationship among the selected variables. Johansen's methodology takes its starting point in the vector autoregressive (VAR) of order p given by

$$y_t = \mu + A_1 y_{t-1} + \cdots + A_p y_{t-p} + \varepsilon_t \quad 4.14$$

wherey_t is an n×1 vector of variables that are integrated of order one and commonly denoted I(1) and ε_t is an n×1 vector of innovations. This VAR can be re-written as

$$\Delta y_t = \mu + \Pi y_{t-1} \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \qquad 4.15$$

where

$$\Pi = \sum_{i=1}^{p} A_i - I \quad and \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j \qquad 4.16$$

According to Hjalmarsson and Osterholm (2007), if the coefficient matrix Π has reduced rank r<n, then there exist n×r matrices α and β each with rank r such that Π=αβ^' and β^' y_t is stationary.

Johansen and Juselius (1990) propose two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the Πmatrix: the trace test and maximum eigenvalue test which are shown in equations (4.17) and (4.18) respectively.

$$J_{trace} = -T \sum_{i=r+1}^{n} \mathrm{In}\left(1 - \hat{\lambda}_i\right) \qquad 4.17$$

$$J_{max} = -T\mathrm{In}\left(1 - \hat{\lambda}_{r+1}\right) \qquad 4.18$$

whereT is the sample size and λ^_i is the i:th largest canonical correlation. The trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors.

4.7.3 Vector Error Correction Model (VECM)

Before the VECM is employed, the study considered the Error correction model (ECM) which focuses on the short run relationship among the variables and it is a distributed lag model. The standard behind this model is that there often may exist a long-run equilibrium relationship between private fixed investment and its determinants. In the short-run there may be disequilibrium. With the error correction mechanism a proportion of the disequilibrium in one period is corrected in the text period.

Short-run integration test can be merged in the model by stipulating an ECM once the long–run combination is witnessed. An ECM could be an autoregressive (AR) intended to utilised with non-stationary sequence identified to be cointegrated. The association of cointegration fabricated into the requirements so as to limits the behaviour in the long-run of the endogenous variables; to meet their cointegration connections whereas letting for adjustment dynamics in the short-run. The cointegration word is the error correction word subsequently the nonconformity from equilibrium in the long-run, and is modified steadily over a series of partial short-run modifications.

According to Engle and Granger (1987), if cointegration has been discovered in the series, it shows that there is a long run connection among them and hereafter the VECM is applied in order to evaluate the short run properties of the cointegrated series. The equations for VECM with two variables can be given by:

$$\Delta y_t = \beta_{y0} + \beta_{y1}\Delta y_{t-1} + \cdots + \beta_{yp}\Delta y_{t-p} + \gamma_{y1}\Delta x_{t-1} + \cdots + \gamma_{yp}\Delta x_{t-p} - \lambda_y(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t^y \quad 4.19$$

$$\Delta x_t = \beta_{x0} + \beta_{x1}\Delta y_{t-1} + \cdots \beta_{xp}\Delta y_{t-p} + \gamma_{x1}\Delta x_{t-1} + \cdots + \gamma_{xp}\Delta x_{t-p} - \lambda_x(y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t^x \quad 4.20$$

Where y_t=α_0+α_1 x_t is the cointegrating relationship in the long-run among the two variables and λ_y and λ_x are the error-correction parameters that measure how y and x react to deviations from the long-run equilibrium. When applying the VECM to more than two variables, consideration for the possibility of the existence of more than one cointegrating relationship must be given. In dealing with this situation according to Engle and Granger

(1987), there should be a generalisation of the procedure for testing cointegrating relationships to allow more than one cointegrating equation as well as modelling a model that allows multiple error-correction terms in each equation. After performing all the major tests of this study, the model will be now taken through a series of both diagnostic and stability testing in order to prove its statistical validity.

4.7.4 Impulse response function

Impulse responses functions were introduced by Sims in 1980. In studying the connections between variables in vector autoregressive model (VAR), the impulse response functions becomes important aspect of the study. The changes response of a variable to a shock in one of the fundamental equations is revealed by the impulse response functions. The present and future values responses are indicated by the function of each of the variables to a one-unit rise in the current value of one of the shocks of VAR (Stock and Watson, 2001). The type of shocks that are relevant for studying specific economic problems is not clearly known. Therefore, to specify meaningful shocks, structural information has to be used.

4.7.5 Residual Diagnostic Tests

The residual diagnostic tests process yield each or together of finite F-distribution or Chi-square asymptotic statistic output and their associated probability numbers (p-values). The p-values indicate the likelihood of finding an examination statistic whose complete value is more than or equal to that of the sample statistic if the null hypothesis is true. Thus, low p-values lead to the rejection of the null hypothesis. Residual analytical examinations on the model outcome comprise of tests such as normalcy test, serial correlation, and heteroscedasticity. The test statistics are as follows: Normality and Histogram test (Jarque-Bera statistic), Serial Correlation (Breusch-Godfrey Serial Correlation LM test), Heteroskedasticity (ARCH LM and White Heteroskedasticity tests) (King'Ori, 2007).

4.7.4.1 Normality and Histogram test

Normality test is used to test for the Jarque-Bera test statistic and it shows whether the series is reverting close to the mean and not showing signs of Ketosis. If the residuals are normally distributed, the histogram should be bell-shaped and the Jarque-Bera test statistics should not be significant. The null hypothesis (H_0) of remaining are usually dispersed and verified against the substitute hypothesis (H_1) of non-normalcy in the supply of the remaining. The H_0: is

excluded if there is a likelihood in the Histogram and normality test is less than the serious likelihood value p = 0.005.

4.7.4.2 Serial Correlation

The sequential connection examination focusses on the Breusch-Godfrey LM test in order to test for the presence or absence of serial correlation in the residuals. The Breusch-Godfrey test is appropriate if lagged reliant variables are involved or not. The null hypothesis H0: to be tested is; H0: there is no serial correlation. The H0: is rejected if the probability in the sequential connection test table is less than the critical probability value P=0.005.

4.7.4.3 Heteroskedasticity

Studenmund (2006) stated that the test for heteroskedasticity is founded on the regression of squared residuals lagged and be appropriate to a session of asymptotic large sample LM tests. Null hypothesis H0: Variance of residuals (u) is constant: homoskedasticity Alternative H1: Variance of residuals (u) is unequal: heteroskedasticity.

a) ARCH LM test

The ARCH LM test tests for heteroskedasticity tests with no cross terms. The null hypothesis test tests that there is no heteroskedasticity. The H0: is rejected if the probably in the table of white heteroskedasticity. The Ho is rejected if the probability in the table of ARCH test less than the critical probability value p= 0.005.

b) White's Heteroskedasticity tests

The test is for white heteroskedasticity tests with no cross terms. The null hypothesis test H0 test that the there is no Heteroskedasticity. The H0 is rejected if the probability in the table of white heteroskedasticity is less than the critical probability value p= 0.005.

4.8 Conclusion

This chapter explained data description and model specification that is going to be used when investigating the determinants of private fixed investment in South Africa. Estimation methods

employed in the study are Unit root test, Cointegration and Error Correction Model. Furthermore, the chapter presents the following tests: Residual Diagnostic Tests (Normality and Histogram test, Serial Correlation test and Heteroskedasticity), and Stability test (Cusum, Ramsey RESET test). The following chapter focuses on the actual estimation of determinants and private fixed investment using the econometric techniques explained in this chapter and also analyse the data.

CHAPTER FIVE

EMPIRICAL ANALYSIS AND RESULTS DISCUSSION

5.1 Introduction

The preceding chapter explained the econometric method adopted to investigate the determinants of private fixed investment in South Africa. The method involve the use time series quarterly data spanning from 1994Q1 to 2015Q4. Therefore, this chapter consists of seven sections which are as follow; section 5.2 present the results for non-stationarity, the study used non-formal test which is visual inspection and formal test which is ADF test and P-P test, whereby section 5.3 discusses the results for cointegration. Section 5.4 present the results for dynamic short run model. Section 5.5 discusses the results for diagnostic statistic test, whereby section 5.6 present the results for model simulation and lastly, section 5.7 provide the summary for the chapter.

5.2 Unit root test results

The literature suggests that the typical and well conventional method of detecting non-stationary is to examine the tests for the existence of unit root. For this purpose, all the variables are examined through graphical inspection of their time series plots. The variables are private fixed investment (PFINV), gross domestic product (GDP), real interest rate (RINT) and general tax rate(TAX) and real effective (REER) exchange rate (see the graphs below).

5.2.1 Visual inspection

Figure 5.1 observed all the variables under study in levels to inspect if the series are stationary. By casual inspection, most of the variables seem to have upward or downward movement of the period, expect real exchange rate which seems to be stationary by inspection.

Figure 5.1: Line graphs of all variables in levels

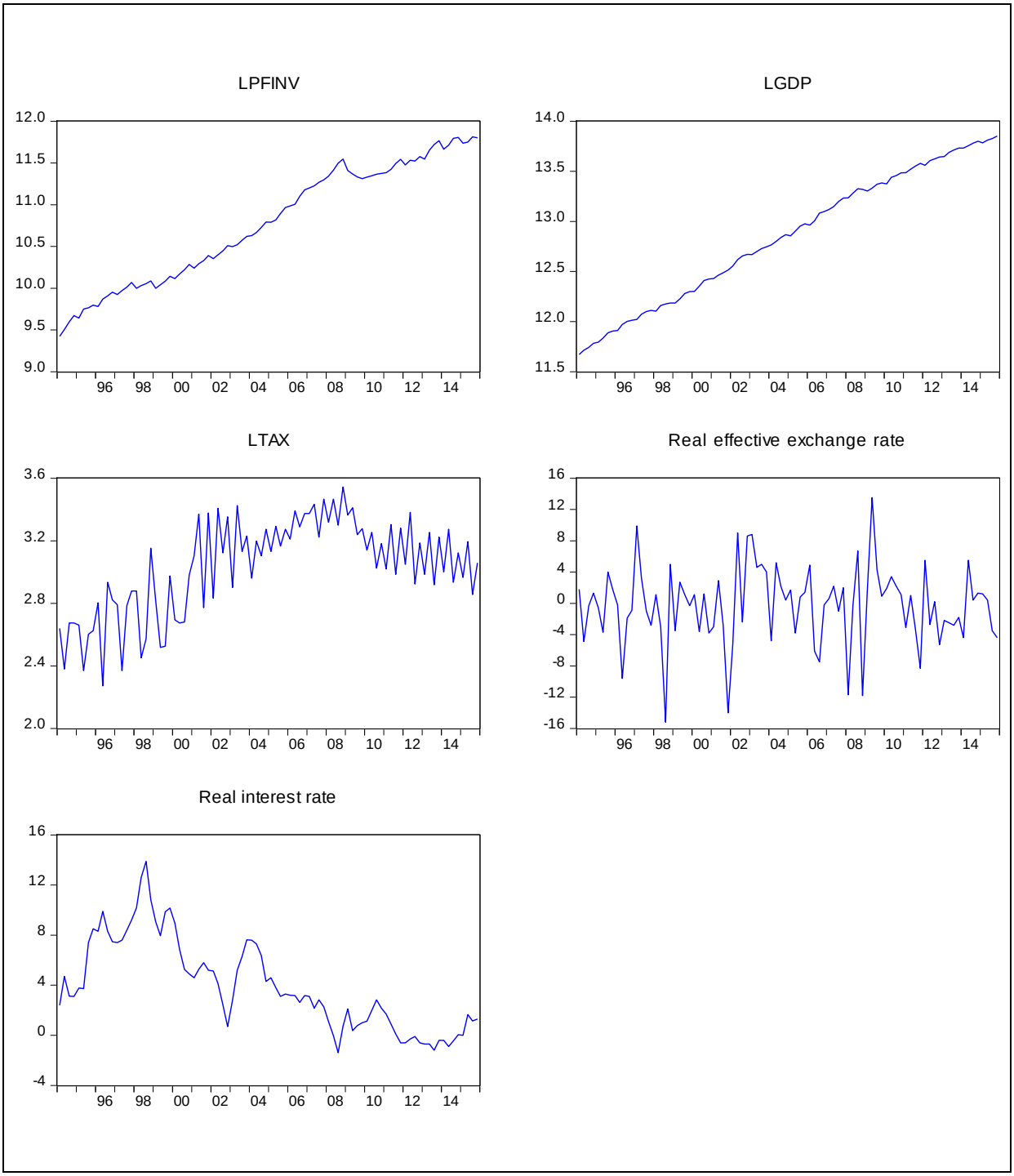
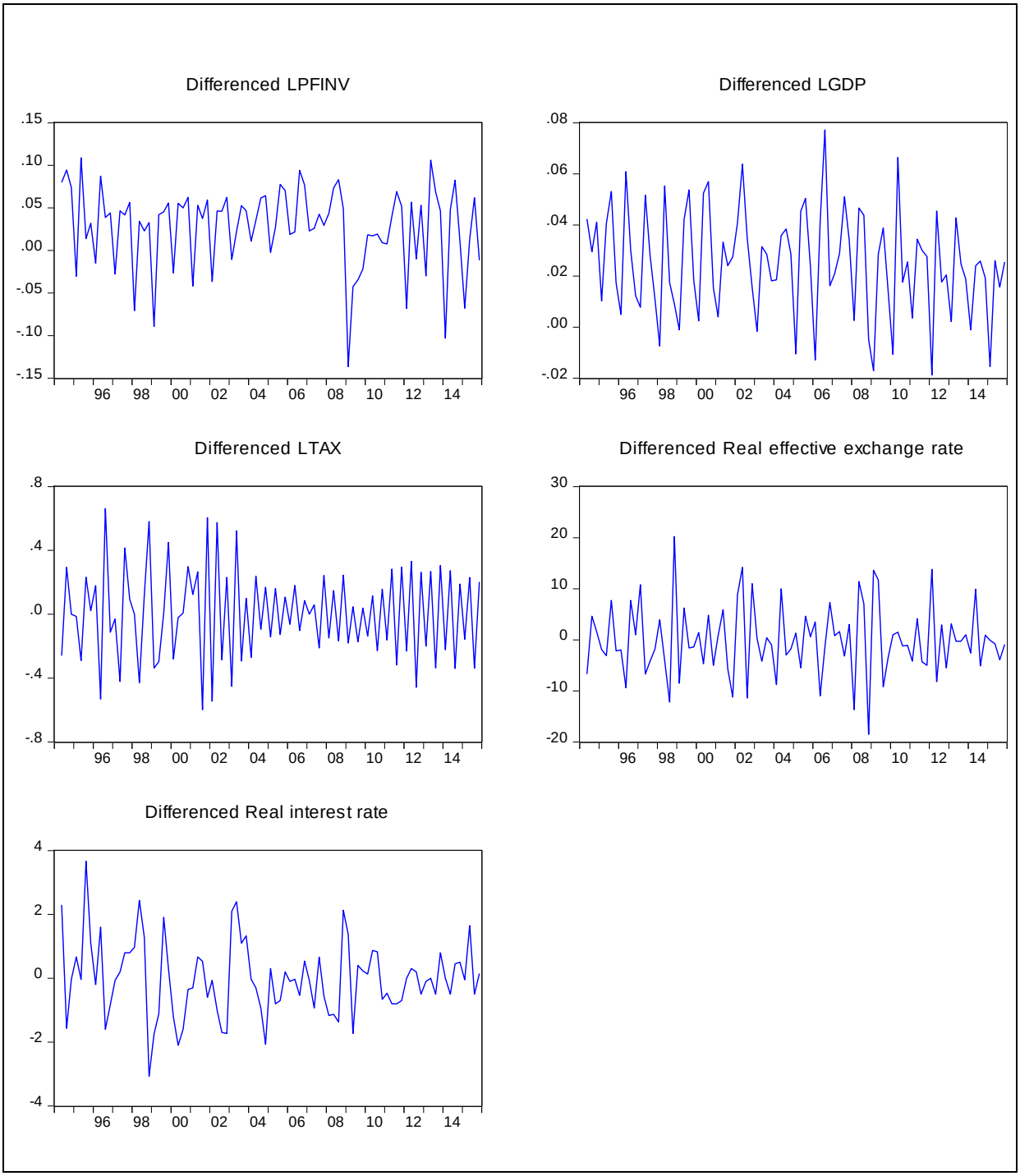


Figure 5.2 below represents all the variables under investigation in first difference. The visual inspection of all the variables are all stationary. It implies that the mean, variance and the covariance of each series is constant over time. It can be concluded that variables are integrated of order one.

Figure 5.2: Line graphs of all variables in first difference



5.2.2 Unit root test results

Table 5.1: Unit root results for Augmented Dickey-Fuller

Variables	ADF results	
	Levels	First difference
LOGPFINV		
Intercept	-0.848960	-3.971412***
Intercept & trend	-1.404571	-4.007374**
LOGGDP		
Intercept	-1.891529	-3.031687**
Intercept & trend	-0.368464	-3.595434**
RINT		
Intercept	-1.801840	-6.441839***
Intercept & trend	-3.339870*	-6.440014***
LOGTAX		
Intercept	-1.709445	-15.73669***
Intercept & trend	-0.333994	-16.18350***
REER		
Intercept	-8.864107***	-12.14287***
Intercept & trend	-8.811513***	-12.07637***

Notes: reported values under levels and first difference are ADF t- statistics values

***/ 1% statistically significant, **/5% statistically significant, */10 statistically significant

Table 5.2: Unit root results for Phillip-Perron

Variables	Phillip-Perron results	
	Levels	First difference
LOGPFINV		
Intercept	-1.600064	-9.439824***
Intercept & trend	-2.121898	-9.534973***
LOGGDP		
Intercept	-2.891439*	-10.35412***
Intercept & trend	-1.269698	-11.93195***
RINT		
Intercept	-1.619451	-7.436577***
Intercept & trend	-3.459661*	-7.373659***
LOGTAX		
Intercept	-5.086356***	-36.66906***
Intercept & trend	-6.670157***	-48.74351***
REER		
Intercept	-8.866076***	-37.12884***
Intercept & trend	-8.813695***	-37.84949***

Notes: reported values under levels and first difference are P-P t- statistics values

***/ 1% statistically significant, **/5% statistically significant, */10 statistically significant

As stated in the methodology chapter, ADF test was employed to identify the order of integration that is the number of times a variable needs to be differenced to make it stationary. The results of these two tests are presented in the Table 5.1. The variables were tested for stationarity under the assumption of constant and no trend, constant and trend. The results show that most of the variables such as LOGPFINV, LOGGDP and RINT are non-stationary in levels but become stationary after first differencing. However, variable such as and REER is

stationary at levels and after first differencing. Table 5.2 reports the result for P-P test for unit root. LOGPFINV, LOGGDP, LOGTAX and RINT are non-stationary in levels but become stationary after first differencing. In contrast, variable such as REER is stationary at levels and also after first differencing. This type of condition is referred as multicointegration by Engsted et al. (1997). Several studies by Pagan, and Wickens, (1989), Harris and Sollis (2003), Enders (2004) and Enders (2010) indicated that it is possible to find equilibrium relationship amongst of variables that are integrated of different orders. After determining that most of the variables are integrated of the different orders which is I(0) and I(1), it is procedural to determine whether there is any long run relationship among private fixed investment and its determinants. This means that variables are ready for the cointegration test.

5.3. Pairwise correlation matrix

Correlation matrix which is a matrix of Pearson-type correlations and impacted by unequal variances, outliers, nonlinearities and non-normality. Nonlinearities correlation could be found using Pearson correlation formulas to the positions of the data without using its actual data values. By doing this, Pearson correlation would be decreased by the impact of distortion that affect it. Table 5.3 shows a matrix of differences that helps to compare the forms of correlation matrices to define a pair of variables that requires an additional study.

Table 5.3: Correlation matrix

Variables	LPFINV	LGDP	LTAX	REER	RINT
LPFINV	1.000	0.993	0.649	-0.013	-0.782
LGDP	0.993	1.000	0.629	-0.000	-0.780
LTAX	0.649	0.629	1.000	0.140	-0.532
REER	-0.013	-0.000	0.140	1.000	-0.082
RINT	-0.782	-0.780	-0.532	-0.082	1.000

Table 5.3 presents pairwise correlation matrix results. The results agree with economic theory that there is a positive correlation between LPFINV and LGDP, and that there is a negative correlation between LPFINV, REER and RINT, except were the results indicate a positive correlation between LTAX and LPFINV, whereas the economic theory state that there is a negative relationship between LPFINV and LTAX.

5.4 Select Lag-length criterion

Johansen procedure requires lag order be determined before cointegration test could be estimated. optimal lag length in a time serie could be identified using different criterions such as: AIC : Akaike information criterion ; BIC : Schwartcz information criterion ; HQ : Hannan-Quinn criterion ; RMSE : Root Mean Square Error ; MAE : Mean Absolute Error; BP : Bias proportion ; LIK : Log-Likelihood. The perception function differs from criterion to criterion. When choosing an appropriate 'lag length' in a time series, Information criteria could be adopted as initial procedures. Clipping down the 'lag length' using the 'likelihood ratio' test, helps to choose a suitable lag lengths, particularly when the sample size is big. Table 5.4 presents the optimal lag length selection criterion results. The study used different criterion such as LR, FPE, AIC, SC and HQ.

Table 5.4: Lag-length criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-410.932	NA	0.012	9.786	9.930	9.844
1	10.209	782.829	1.100	0.465	1.327*	0.812
2	54.489	77.099	7.010	0.012	1.592	0.647*
3	88.027	54.449*	5.830*	-0.188*	2.110	0.735

# 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 on the results on Table 5.4, it can be observed that the optimal lag length is 3 based on LR, FPE and AIC. The next step is to estimate the long run equilibrium using the Johansen cointegration.

5.5 Cointegration Analysis

Table 5.5: Long run cointegration results

Unrestricted Cointegration Rank Test (Trace)			
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	P-value
None *	95.169	60.061	0.000
At most 1 *	44.670	40.174	0.016
At most 2	15.867	24.275	0.389
At most 3	5.829	12.320	0.457
At most 4	0.175	4.129	0.728
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values			
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	P-value
None *	50.498	30.439	0.000
At most 1 *	28.803	24.159	0.010
At most 2	10.037	17.797	0.481
At most 3	5.653	11.224	0.390
At most 4	0.175	4.129	0.728
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values			

Table 5.5 presents the results for Johansen cointegration. Table 5.5 also shows the result for unrestricted cointegration rank test (Trace) and unrestricted cointegration rank test (maximum eigenvalue) results. The test helps to determine the long run equilibrium private investment, real interest rate, gross domestic product, general tax rate and real effective exchange rate. The results show that there are two cointegrating vectors. The existence of cointegration was confirmed by comparing the trace and maximum statistics if it is greater than 5% critical value. Since the results from cointegration indicates two cointegrating vectors the VECM is visualised as following equation 5.1.

$$\prod z_{t-1} = \alpha\beta' z_{t-1} = \begin{bmatrix} \alpha_{11}\alpha_{12} \\ \alpha_{21}\ \alpha_{22} \\ \alpha_{31}\ \alpha_{33} \\ 0 \quad 0 \\ \alpha_{51}\alpha_{52} \\ \alpha_{61}\ \alpha_{62} \end{bmatrix} \begin{bmatrix} 1 & 0 & \beta_{31}\beta_{41}\beta_{51}\beta_{61} \\ 0 & 1 & \beta_{32}\beta_{42}\beta_{52}\beta_{62} \end{bmatrix} \begin{bmatrix} lnPFINV_{t-1} \\ RINT_{t-1} \\ lnGDP_{t-1} \\ lnLTAX_{t-1} \\ REER_{t-1} \\ Constant_t \end{bmatrix} \quad (5.1)$$

where β_i and α_i represent the parameters for long run and short run of the VECM respectively. The study applied restrictions in the short run and long run VECM part. Therefore, there are two equations specified which is private fixed investment function and real interest rate function.

5.6 Restricted long run coefficients

Table 5.6: Long run cointegration parameters

Cointegrating Equation	Dependent Variables	
	CE1: LPFINV	CE2: RINT
LPFINV(-1)	1.000	0.000
RINT(-1)	0.000	1.000
LGDP(-1)	-0.700 (0.052) [-13.423] ***	-11.800 (5.715) [-2.064] ***
LTAX(-1)	-0.819 (0.220) [-3.723] ***	50.041 (24.118) [2.074] ***
REER(-1)	0.077 (0.016) [4.664] ***	-8.753 (1.808) [-4.840] ***

From equation (5.1), in the long run for first cointegrating equation, zero restriction is imposed on real interest rate (RINT) because now becomes the dependent in the second equation. Also, restrictions were impose on private fixed investment in second equation because is an endogenous variable in the first equation. Simply, the restrictions imposed is to imply that the said variable does not play part in determination of the dependent variable. The long run parameters for both equation can be interpreted as follows:

- First cointegrating vector: Private fixed investment (PFINV) function

- There is a long run positive relationship between private fixed investment and GDP. The results show that a 1% increase in GDP will lead to 0.70% increase on private fixed investment.
- On the other hand, private fixed investment increase by 0.81% when tax rate increase with 1%. Therefore, there is a positive association between tax rate and private fixed investment in the long run.
- Prior to economic theory, there is a negative relationship between real effective exchange rate and private fixed investment. A 1% increase in real exchange rate will lead to 0.07% decrease on private fixed investment.

Second cointegratin vector: Real interest rate (RINT) function:

- There is a long run positive relationship between real interest rate and GDP. A 1% increase in GDP will lead to 11.80% increase on real interest rate.
- The results also show that there is negative association between tax rate and real interest rate. The coefficient of tax rate is 50.04 and is statistically significant.
- The coefficient for real exchange rate is -8.75 and is statistically significant. This result implies that there is positive relationship between real exchange rate and real interest rate.

It should be noted that the interpretation of second cointegrating vector is not the interest of the study but was interpreted based on econometrics purpose. The most crucial results are the ones interpreted in the first cointegrating equation. The residuals for cointegrating vectors are plotted in Figure 5.3.

Figure 5.3: The residuals for cointegrating vectors

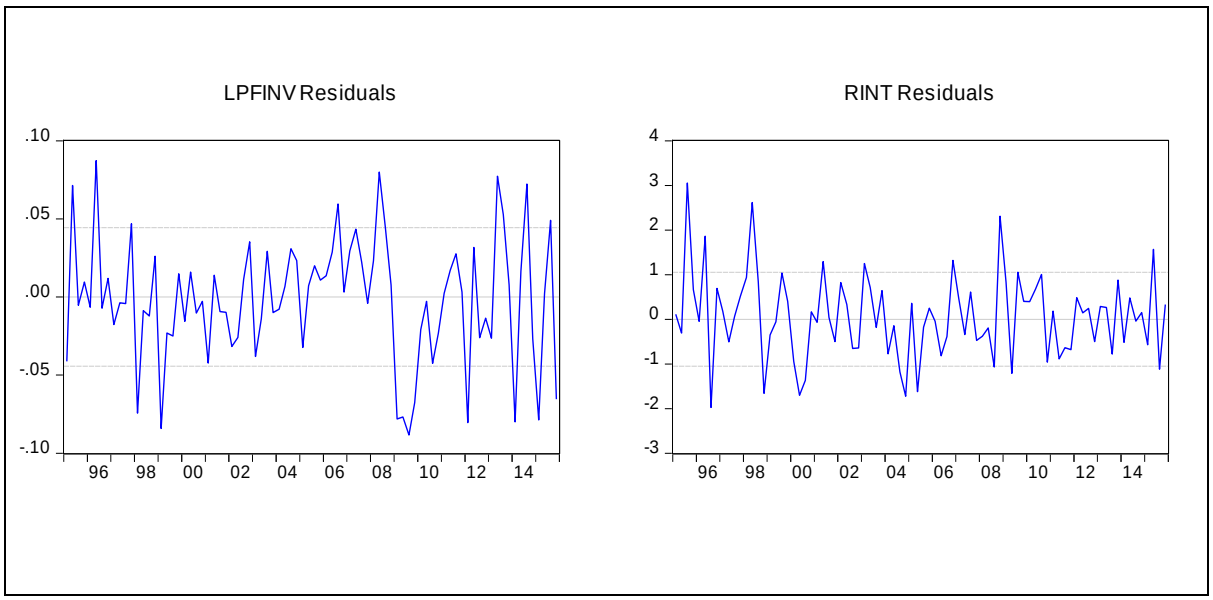


Figure 5.3 is for the estimated contegrating relations of the vectors. The cointegrating relations were found to be appropriate, since the residuals appear to be reverting around zero.

5.7 Weak exogeneity test and short run adjustment mechanism

The preceding case is to estimate the long run equilibrium, following is to estimate the error correction parameter. Table 5.7 presents the results for short run adjustment which shows the dynamic adjustment towards long run equilibrium path.

Table 5.7 Short run adjustment process

	Cointegrating Equation 1	Cointegrating Equation 2
D(LPFINV)	-0.059 (0.026) [-2.252]	-0.001 (0.0003) [-2.320]
D(RINT)	-0.685 (0.618) [-1.108]	-0.019 (0.007) [-2.66]
D(LGDP)	-0.069 (0.010) [-6.914]	-0.001 (0.0001) [-4.011]
D(LTAX)	0.000 (0.000) [NA]	0.000 (0.000) [NA]
D(RER)	1.834 (3.108) [0.590]	0.131 (0.035) [3.656]
LR test for binding restriction (rank = 2): X^2 = 4.265 Probability = 0.118		

This study imposes restrictions on the short run VECM model for South Africa since the trace and maximum eigenvalue statistics shows two cointegrating vectors. From cointegrating equation 1, zero restrictions were imposed tax rate. This implies that the study of private fixed investment can function without tax rate helping to bring back to equilibrium in the long. The results for likelihood ratio for binding restrictions of LR = 4.265 and probability of (0.118). This result implies that since the LR does not reject the restrictions it means that the equations are well specified. For first cointegrating, vector the error correct term is negative with the coefficient of -0.059 and is statistically significant with the t-statistics of (-2.252). This result implies that 5.9% of the gap between private fixed investment and its equilibrium value is eliminated in the short run. In the second cointegrating vector, the error correction term is -0.001 with a t-statistics of (-2.320). This error correct term for second cointegrating vector, implies that almost 0.1% is adjusted in the long run.

Table 5.8: Diagnostic test results

Test	Statistics	Probability	Decision
Heteroscedasticity	544.8151	0.1385	No heteroscedasticity
Serial correlation	34.36493	0.1003	No serial correlation
Normality(Kurtosis)	2.180537	0.8236	Residuals are normally distributed

Figure 5.4: Inverse Root polynomial

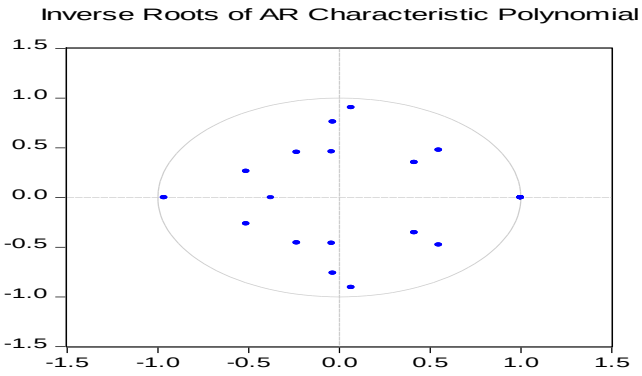


Table 5.8 presents the results for diagnostic tests. The results show that the model of the study has passed all the test. Meaning there are no heteroscedasticity and serial correlation problems. Lastly the results indicate that the residuals are normally distributed. To determine that dynamic stability of the model, the inverse root was tested. As Figure 5.4 shows, the result of the estimated VAR is stable.

Figure 5.5: Impulse response function for cointegration vector 1

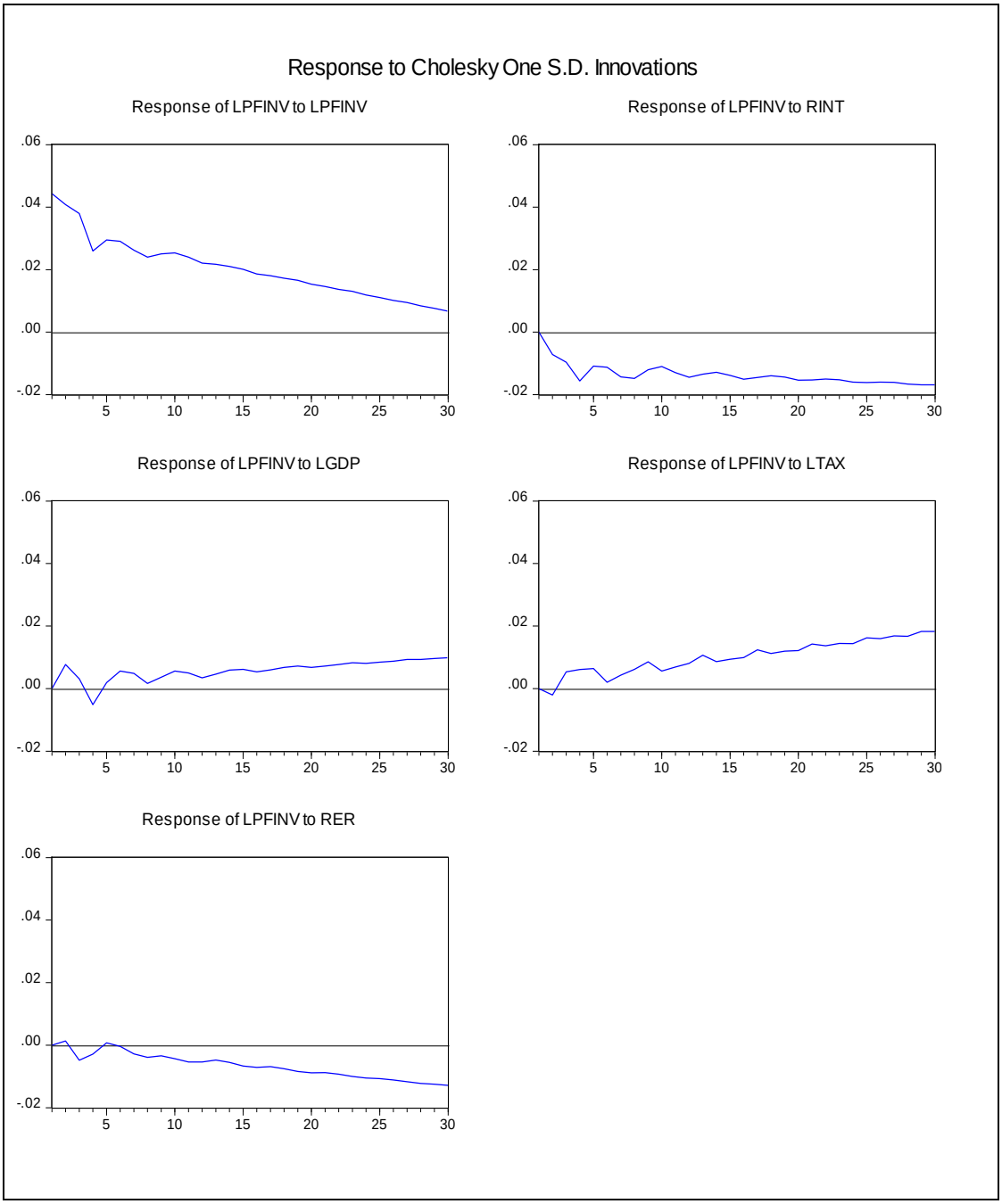


Figure 5.5 presents the results for impulse response function for cointegrating vector 1. It can be observed that private fixed investment respond positively to a shock to itself for 30 periods applied. Private fixed investment responds negatively to a sudden shock from real interest rate and real effective exchange rate throughout the 30 periods whereas private fixed investment react positively to a shock of gross domestic product and tax rate.

Figure 5.6: Impulse response function for cointegration vector 2

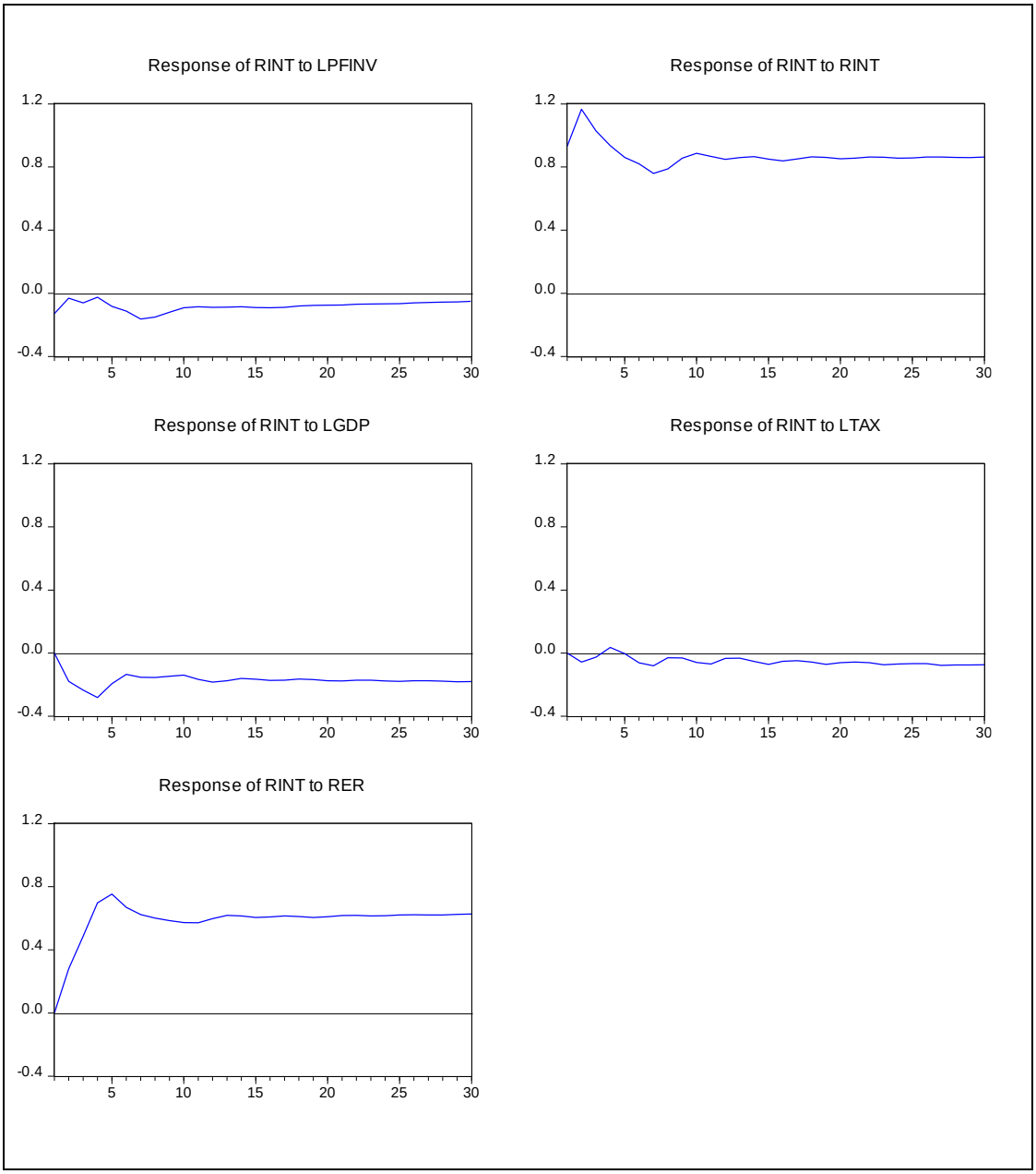


Figure 5.6 presents the results for impulse response function for cointegrating vector 2. It can be observed that real interest rate respond positively to a shock of itself for 30 periods applied. Real interest rate responds negatively to a sudden shock from private fixed investment, gross domestic product and tax rate throughout the 30 periods, whereas real interest rate reacted positively to a shock of real effective exchange rate.

5.8 Variance decomposition

This section computes the forecast error variance decomposition of the economic variables. Variance decomposition measures the contribution of shock to the variance decomposition of

that variable. Information about individual shock and its effect on endogenous variables in the VAR system is known.

Table 5.9 Variance Decomposition of Private fixed investment

Variance Decomposition of LPFINV:						
Period	S.E.	LPFINV	RINT	LGDP	LTAX	RER
1	0.044	100.000	0.000	0.000	0.000	0.000
2	0.061	96.895	1.361	1.585	0.111	0.047
3	0.073	94.913	2.703	1.291	0.615	0.475
4	0.079	90.717	6.141	1.504	1.107	0.530
5	0.085	89.797	6.890	1.340	1.508	0.462
6	0.091	89.091	7.571	1.552	1.375	0.409
7	0.096	87.454	9.009	1.649	1.434	0.451
8	0.100	85.784	10.427	1.537	1.688	0.562
9	0.105	84.698	10.920	1.536	2.220	0.624
10	0.109	84.076	11.165	1.690	2.327	0.740
11	0.112	83.009	11.751	1.773	2.544	0.919
12	0.116	81.682	12.607	1.757	2.873	1.080
13	0.119	80.355	13.158	1.805	3.500	1.179
14	0.122	79.309	13.599	1.949	3.817	1.323
15	0.125	78.023	14.151	2.092	4.189	1.542
16	0.128	76.580	14.878	2.170	4.594	1.776
17	0.131	75.041	15.433	2.280	5.273	1.971
18	0.134	73.695	15.895	2.442	5.760	2.206
19	0.137	72.228	16.365	2.618	6.292	2.494
20	0.139	70.685	16.955	2.753	6.804	2.800
21	0.142	69.017	17.463	2.901	7.544	3.073
22	0.145	67.463	17.918	3.080	8.163	3.374
23	0.147	65.837	18.342	3.280	8.827	3.712
24	0.150	64.190	18.839	3.457	9.438	4.074
25	0.153	62.442	19.280	3.636	10.225	4.415
26	0.155	60.772	19.688	3.831	10.933	4.774
27	0.158	59.064	20.046	4.045	11.687	5.155
28	0.161	57.375	20.443	4.245	12.375	5.560
29	0.164	55.623	20.797	4.442	13.188	5.947
30	0.167	53.935	21.129	4.645	13.943	6.345

Table 5.9 above report the results for variance decomposition for private fixed investment for South Africa in a period of 30 years. However, it should also be noted that the study only

presented that results of variance decomposition for equation of interest where private fixed investment is a dependent. The results show that the crucial source of variation in private fixed investment is its own shock which accounts 53.9%. Where real interest rate accounts for 21.1% in the long run. Followed by tax rate by 13.9%, real exchange rate by 6.3% and lastly is gross domestic product by 4.6% in the long run. Thus, the driving force behind an increase of private fixed investment is real interest rate in this study.

5.9 Summary

This chapter presented that econometric results of the study. The study estimated a very robust private fixed investment model in South Africa for the period under investigation. The study subjected all the variables to unit root testing by applying two formal unit root test such as ADF and P-P test. The results from these two tests found evidence that most variables in the study they were no-stationary at levels, implying that any further use of such variables might lead to spurious findings. However, after all the variables were differenced once, they exhibited stationarity meaning that mean, variance and covariance of each series is constant over time. After determining the order of intergration for each series, cointegration was determined using Johansen cointegration method. The results indicated that there is a long run relationship among the variables employed in the study. Therefore, dynamic short run model was estimated and subjected to diagnostic test. All the outcomes from the short run model were as expected and shown no sign of violation of OLS assumptions.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the main findings and recommendations of the study. Section 6.2 provides the summary of the main findings of the study. Section 6.3 discusses the recommendation suggested to investment policy makers. Lastly, section 6.4 provides the discussion on suggestions for future studies.

6.2 Summary of the main findings

The principal aim of this study was to investigate the determinants of private fixed investment in South Africa since the inception of democracy in 1994. The study consists of six chapters. Chapter one of this study provided the background of the study and also highlight the problem statement of the study. The chapter also provided the main research questions the study intended to undertake, which are (1) what are the determinants of private fixed investment in South Africa? (2) What is the relationship between private fixed investment and the selected determinants? In order to answer the above research question, several steps where undertaken such as to review the overview of the economy, to study the literature related to the study and analyse the data for private fixed investment and its determinants.

Chapter two provided the overview of the economy based on the private fixed investment and its determinants. The study reviewed the trend of all the variables in the study starting on private fixed investment.

Chapter three was presented to review the literature related to the study. The chapter was divided in two sections. The first part reviewed different theories emanation from the accelerator theory, neoclassical theory, Tobin Q and the cash flow theory of investment, and the second part was empirical literature by other researches.

Chapter four of the study discussed the econometric method applied in this study. The chapter described the variables involved and collection of data from various data sources. The study discussed that it adopted Johansen cointegration technique to investigate the long run relationship between private fixed investment and its determinants for the period under investigation. However, before the study can describe the use of cointegration technique

adopted, it also discussed the preliminary tests of unit root such as ADF and P-P test. The purpose of this test was to determine the order of each variable under study. Following this chapter was that of analysis.

Chapter five presented the results and discussion of data in the study. This chapter estimated the main model of the study using Johansen cointegration technique to estimate the long run relationship between private fixed investment and its determinants. The results of the study concludes that for the period under investigation gross domestic product have the positive sign as expected. This variable suggest that as GDP grows this will have a positive impact on private fixed investment in the long run. This result are consistent with empirical and theoretical literature with the work of Omri (2014) and Eita and Du toit (2009).

The findings of the study confirmed that in South Africa for the period under study tax rate is a complementary to private fixed investment. The variables have shown that it is statistically significant in the long run. This result implies that since democracy tax rate seems not to discourage the South African private fixed investment. The results are inconsistent with the empirical work of Yagan (2015), Ahmad and Qayyum (2008), Mlambo and Oshikoya (2001), Akanbi (2013), according to their findings interest rate and tax rate affect private investment nagetively, because when interest rate and tax rate increases the return of investment decreases. Regression analysis by Abbas and Klemm (2013), also discloses that higher tax rates harmfully affect domestic investment and foreign direct investment FDI, but do increase revenues in the short run.

The coefficient for real exchange rate was negative as expected. This finding is consistent with theoretical and empirical literature of. The results suggest that as more the currency depreciates this will stimulate the growth of private fixed investment in South Africa. This result is consistent to findings by Bahmani-Oskooee and Hajilee (2013), Serven (2003) and Akanbi (2013), both researchers found that there is a strong negative relationship between real effective exchange rate and private investment.

6.3 Policy Recommendations

It is apparent that even the best economic model cannot achieve the expected outcomes immediately. It is however, important to look at long-term results. The following recommendations are proposed:

- The findings of the study show significant expected negative effects of real effective exchange rate on private fixed investment in South Africa. This is mostly because the South African monetary policy on exchange rate complements private fixed investment.

- One of the policy recommendations proposed by this study is that GDP and general tax rate promote the flow of private fixed investment into South Africa. But this presents some policy dilemmas for policy makers, as both growth and general tax rate are difficult to accomplish simultaneously. This implies that the South African policy makers will have to make a trade-off between both. Given the high unemployment rates, it will probably be in the interest to focus more on growth in order to generate more employment.

6.4 Suggestions for further research

The study focused only on private fixed investment in South Africa and some of its determinants which are gross domestic product, general tax rate, real interest rate and real effective exchange rate. The study found that there is a short term and long term relationship between the selected determinants and private fixed investment. Except for the selected determinants there are other determinants that have been excluded in the study, because of time constraints. When inflation is low, consumers and businesses are able to make long-term plans because they know that the purchasing power of their money will hold and will not be steadily eroded year after year.

Further research focusing more specifically on each specific determinants such as inflation, user cost, gross capital formation for public sector, financial development and saving may likely discover interesting findings about separate determinants is recommended. The inclusion of these determinants can be interesting for further studies on the factors of private fixed investment in the South African economy. The impact of savings on private fixed investment is the area that needs to be researched. Another area of interest of research that needs to be investigated is the explanation between private fixed investment and gross capital formation on public sector. Further research could be done to investigate the impact of corporate tax on private fixed investment.

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APPENDICES

Appendix A: Lag length selection

VAR Lag Order Selection Criteria
Endogenous variables: LPFINV LGDP LTAX RER RINT
Exogenous variables: C
Date: 04/10/17 Time: 17:20
Sample: 1994Q1 2015Q4
Included observations: 85

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-410.9327	NA	0.012244	9.786652	9.930337	9.844446
1	10.20970	782.8294	1.10e-06	0.465654	1.327766*	0.812420
2	54.48976	77.09940	7.01e-07	0.012006	1.592545	0.647743*
3	88.02745	54.44942*	5.83e-07*	-0.188881*	2.110085	0.735827

* 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 B: Johansen Cointegration Test

Date: 04/10/17 Time: 17:22
Sample (adjusted): 1995Q1 2015Q4
Included observations: 84 after adjustments
Trend assumption: No deterministic trend
Series: LPFINV LGDP LTAX RER RINT
Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.451833	95.16920	60.06141	0.0000
At most 1 *	0.290290	44.67050	40.17493	0.0165
At most 2	0.112635	15.86701	24.27596	0.3893
At most 3	0.065094	5.829089	12.32090	0.4572
At most 4	0.002083	0.175141	4.129906	0.7289

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.451833	50.49870	30.43961	0.0001
At most 1 *	0.290290	28.80348	24.15921	0.0109
At most 2	0.112635	10.03793	17.79730	0.4812
At most 3	0.065094	5.653948	11.22480	0.3907
At most 4	0.002083	0.175141	4.129906	0.7289

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LPFINV	LGDP	LTAX	RER	RINT
5.305696	-4.134387	-2.623778	0.084627	0.039163
1.186403	-0.423722	-2.446749	0.454914	-0.048131
10.89803	-9.069565	-0.733937	0.082218	0.394959
-1.082505	0.509638	2.022693	-0.091720	-0.285555
1.807734	-0.117472	-5.747621	-0.064870	-0.065122

Unrestricted Adjustment Coefficients (alpha):

D(LPFINV)	-0.010300	0.003990	-0.005936	-0.000857	-0.001503
D(LGDP)	-0.012535	-0.000669	-0.000440	-0.000473	-0.000239
D(LTAX)	0.011999	-0.027183	-0.014725	-0.025262	6.26E-05
D(RER)	0.382251	-2.310053	-0.441008	0.593441	0.042314
D(RINT)	-0.147965	0.308928	-0.174366	0.060248	0.025038

1 Cointegrating Equation(s): Log likelihood 94.12846

Normalized cointegrating coefficients (standard error in parentheses)

LPFINV	LGDP	LTAX	RER	RINT
1.000000	-0.779235	-0.494521	0.015950	0.007381
	(0.03821)	(0.16194)	(0.01156)	(0.00813)

Adjustment coefficients (standard error in parentheses)

D(LPFINV)	-0.054647
	(0.02568)
D(LGDP)	-0.066505
	(0.00964)
D(LTAX)	0.063665
	(0.07735)
D(RER)	2.028109
	(3.31570)
D(RINT)	-0.785059
	(0.63760)

2 Cointegrating Equation(s): Log likelihood 108.5302

Normalized cointegrating coefficients (standard error in parentheses)

LPFINV	LGDP	LTAX	RER	RINT
1.000000	0.000000	-3.388923	0.694392	-0.081142
		(0.30980)	(0.13197)	(0.09099)
0.000000	1.000000	-3.714412	0.870650	-0.113603
		(0.40143)	(0.17100)	(0.11790)

Adjustment coefficients (standard error in parentheses)

D(LPFINV)	-0.049913	0.040892
	(0.02618)	(0.02001)
D(LGDP)	-0.067299	0.052106
	(0.00987)	(0.00755)
D(LTAX)	0.031415	-0.038092
	(0.07720)	(0.05902)
D(RER)	-0.712545	-0.601553
	(3.03710)	(2.32168)
D(RINT)	-0.418546	0.480847
	(0.62078)	(0.47455)

3 Cointegrating Equation(s): Log likelihood 113.5492

Normalized cointegrating coefficients (standard error in parentheses)

LPFINV	LGDP	LTAX	RER	RINT
1.000000	0.000000	0.000000	1.249367	0.254866
			(0.38286)	(0.26512)
0.000000	1.000000	0.000000	1.478928	0.254678
			(0.44462)	(0.30789)
0.000000	0.000000	1.000000	0.163762	0.099149
			(0.08954)	(0.06200)

Adjustment coefficients (standard error in parentheses)

D(LPFINV)	-0.114600	0.094726	0.021617
	(0.05798)	(0.04750)	(0.01743)
D(LGDP)	-0.072096	0.056099	0.034848
	(0.02211)	(0.01811)	(0.00665)
D(LTAX)	-0.129063	0.095461	0.045835
	(0.17157)	(0.14054)	(0.05159)
D(RER)	-5.518663	3.398196	4.972849
	(6.77220)	(5.54752)	(2.03623)
D(RINT)	-2.318795	2.062272	-0.239667
	(1.36657)	(1.11944)	(0.41089)

4 Cointegrating Equation(s): Log likelihood 116.3761

Normalized cointegrating coefficients (standard error in parentheses)

LPFINV	LGDP	LTAX	RER	RINT
1.000000	0.000000	0.000000	0.000000	2.671605
				(1.04531)
0.000000	1.000000	0.000000	0.000000	3.115473
				(1.23473)
0.000000	0.000000	1.000000	0.000000	0.415925
				(0.14867)
0.000000	0.000000	0.000000	1.000000	-1.934371
				(0.82494)

Adjustment coefficients (standard error in parentheses)

D(LPFINV)	-0.113672	0.094289	0.019883	0.000534
	(0.05820)	(0.04755)	(0.01991)	(0.00228)
D(LGDP)	-0.071585	0.055858	0.033892	-0.001358
	(0.02218)	(0.01812)	(0.00759)	(0.00087)
D(LTAX)	-0.101717	0.082586	-0.005262	-0.010244
	(0.16812)	(0.13736)	(0.05752)	(0.00658)
D(RER)	-6.161066	3.700636	6.173198	-1.109217
	(6.74171)	(5.50803)	(2.30665)	(0.26402)
D(RINT)	-2.384013	2.092976	-0.117804	0.108152
	(1.36905)	(1.11852)	(0.46841)	(0.05362)

Appendix C: Restricted long run coefficients

Vector Error Correction Estimates
Date: 03/22/17 Time: 16:20
Sample (adjusted): 1995Q1 2015Q4
Included observations: 84 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
B(1,1)=1, B(1,2)=0, B(2,1)=0, B(2,2)=1, A(4,2)=0, A(4,1)=0
Convergence achieved after 175 iterations.
Restrictions identify all cointegrating vectors
LR test for binding restrictions (rank = 2):

Chi-square(2)	4.265757
Probability	0.118496

Cointegrating Eq:	CointEq1	CointEq2
LPFINV(-1)	1.000000	0.000000
RINT(-1)	0.000000	1.000000
LGDP(-1)	-0.700254	-11.80006
	(0.05217)	(5.71506)
	[-13.4234]	[-2.06473]
LTAX(-1)	-0.819790	50.04159
	(0.22015)	(24.1183)
	[-3.72378]	[2.07484]
RER(-1)	0.077000	-8.753650
	(0.01651)	(1.80836)
	[4.66483]	[-4.84065]

Error Correction:	D(LPFINV)	D(RINT)	D(LGDP)	D(LTAX)	D(RER)
CointEq1	-0.059617	-0.685593	-0.069694	0.000000	1.834711
	(0.02646)	(0.61838)	(0.01008)	(0.00000)	(3.10820)
	[-2.25299]	[-1.10870]	[-6.91415]	[NA]	[0.59028]
CointEq2	-0.000709	-0.019050	-0.000467	0.000000	0.131219
	(0.00031)	(0.00714)	(0.00012)	(0.00000)	(0.03589)
	[-2.32015]	[-2.66832]	[-4.01161]	[NA]	[3.65656]
D(LPFINV(-1))	-0.156371	9.165226	-0.014977	0.019265	-21.05958
	(0.15856)	(3.76337)	(0.05993)	(0.47421)	(18.4570)
	[-0.98618]	[2.43538]	[-0.24992]	[0.04062]	[-1.14101]
D(LPFINV(-2))	0.076841	1.207153	0.032018	0.301825	-14.67704
	(0.15239)	(3.61696)	(0.05760)	(0.45576)	(17.7390)
	[0.50423]	[0.33375]	[0.55592]	[0.66224]	[-0.82739]
D(LPFINV(-3))	-0.101914	5.138527	0.037284	-0.014161	-6.437213
	(0.14423)	(3.42332)	(0.05451)	(0.43136)	(16.7893)
	[-0.70659]	[1.50104]	[0.68396]	[-0.03283]	[-0.38341]
D(RINT(-1))	-0.006640	0.274364	-0.002402	-0.002081	0.137094
	(0.00509)	(0.12089)	(0.00193)	(0.01523)	(0.59291)
	[-1.30353]	[2.26946]	[-1.24794]	[-0.13659]	[0.23122]

D(RINT(-2))	0.001411	-0.174587	-0.000148	0.008855	-0.543981
	(0.00516)	(0.12242)	(0.00195)	(0.01543)	(0.60040)
	[0.27365]	[-1.42613]	[-0.07573]	[0.57405]	[-0.90603]
D(RINT(-3))	-0.005879	0.023126	0.001305	-0.037480	-0.432220
	(0.00483)	(0.11456)	(0.00182)	(0.01444)	(0.56184)
	[-1.21812]	[0.20187]	[0.71554]	[-2.59642]	[-0.76930]
D(LGDP(-1))	0.514952	-15.69505	-0.249222	0.174149	16.52798
	(0.40348)	(9.57643)	(0.15249)	(1.20670)	(46.9665)
	[1.27626]	[-1.63893]	[-1.63433]	[0.14432]	[0.35191]
D(LGDP(-2))	-0.250641	-9.814130	-0.476482	1.616946	-4.856309
	(0.36692)	(8.70853)	(0.13867)	(1.09734)	(42.7100)
	[-0.68310]	[-1.12696]	[-3.43603]	[1.47351]	[-0.11370]
D(LGDP(-3))	-0.543538	-9.357487	-0.233814	-0.134280	53.89786
	(0.36959)	(8.77186)	(0.13968)	(1.10532)	(43.0207)
	[-1.47067]	[-1.06676]	[-1.67391]	[-0.12149]	[1.25284]
D(LTAX(-1))	-0.029535	-0.170374	-0.053109	-0.898275	-2.480001
	(0.03192)	(0.75759)	(0.01206)	(0.09546)	(3.71551)
	[-0.92529]	[-0.22489]	[-4.40242]	[-9.40977]	[-0.66747]
D(LTAX(-2))	0.033535	-0.059779	-0.029395	-0.610416	-1.945878
	(0.04145)	(0.98381)	(0.01567)	(0.12397)	(4.82501)
	[0.80903]	[-0.06076]	[-1.87636]	[-4.92398]	[-0.40329]
D(LTAX(-3))	0.033971	0.071083	-0.005069	-0.610032	-5.613256
	(0.03071)	(0.72892)	(0.01161)	(0.09185)	(3.57489)
	[1.10613]	[0.09752]	[-0.43675]	[-6.64168]	[-1.57019]
D(RER(-1))	-0.001349	-0.051621	0.000829	0.002903	0.032104
	(0.00206)	(0.04884)	(0.00078)	(0.00615)	(0.23953)
	[-0.65573]	[-1.05692]	[1.06588]	[0.47176]	[0.13403]
D(RER(-2))	-0.001772	-0.030450	0.000152	-0.000588	-0.081175
	(0.00158)	(0.03754)	(0.00060)	(0.00473)	(0.18410)
	[-1.12025]	[-0.81117]	[0.25373]	[-0.12437]	[-0.44093]
D(RER(-3))	-0.001155	0.013865	-0.000165	-0.005666	0.048752
	(0.00112)	(0.02648)	(0.00042)	(0.00334)	(0.12986)
	[-1.03538]	[0.52364]	[-0.39248]	[-1.69818]	[0.37543]
R-squared	0.286329	0.324275	0.475035	0.826422	0.559534
Adj. R-squared	0.115900	0.162908	0.349670	0.784971	0.454348
Sum sq. resids	0.131681	74.17823	0.018809	1.177797	1784.214
S.E. equation	0.044333	1.052206	0.016755	0.132586	5.160432
F-statistic	1.680047	2.009551	3.789217	19.93712	5.319482
Log likelihood	152.0532	-113.9683	233.7870	60.03035	-247.5393
Akaike AIC	-3.215553	3.118293	-5.161596	-1.024532	6.298555
Schwarz SC	-2.723602	3.610244	-4.669645	-0.532581	6.790506
Mean dependent	0.025344	-0.021429	0.024623	0.004578	-0.067857
S.D. dependent	0.047149	1.150044	0.020777	0.285923	6.985996

Determinant resid covariance (dof adj.)	1.63E-07
Determinant resid covariance	5.25E-08
Log likelihood	106.3973
Akaike information criterion	-0.271365
Schwarz criterion	2.477773

Appendix D: Data used in this study

Date	PRIVATE FIXED INVESTMENT	Real effective exchange rate	GROSS DOMESTIC PRODUCT	General Tax rate	Real interest rate
1994/01	12382	1,8	117124	14	2,4
1994/02	13412	-4,9	122178	10,8	4,7
1994/03	14741	-0,3	125829	14,5	3,13
1994/04	15870	1,3	131102	14,5	3,1
1995/01	15396	-0,6	132451	14,3	3,77
1995/02	17167	-3,7	137941	10,7	3,73
1995/03	17409	4	145466	13,5	7,4
1995/04	17974	1,8	148012	13,8	8,5
1996/01	17704	-0,2	148736	16,5	8,3
1996/02	19321	-9,6	158071	9,7	9,9
1996/03	20083	-1,9	162896	18,8	8,3
1996/04	20987	-0,9	164908	16,8	7,47
1997/01	20411	9,9	166191	16,3	7,4
1997/02	21383	3,2	174990	10,7	7,6
1997/03	22295	-1	179978	16,2	8,4
1997/04	23588	-2,8	181958	17,8	9,2
1998/01	21976	1,1	180609	17,8	10,17
1998/02	22741	-3	190871	11,6	12,61
1998/03	23271	-15,2	194212	13,1	13,89
1998/04	24045	5	195966	23,4	10,82
1999/01	21987	-3,5	195750	16,7	9,07
1999/02	22931	2,7	204170	12,4	7,95
1999/03	23996	1,1	215429	12,5	9,86
1999/04	25376	-0,3	219404	19,6	10,16
2000/01	24713	1,1	219943	14,8	8,95
2000/02	26122	-3,6	231797	14,5	6,85
2000/03	27465	1,2	245383	14,6	5,25
2000/04	29234	-3,8	249201	19,7	4,9
2001/01	28032	-3	250193	22,3	4,6
2001/02	29558	2,9	258655	29,1	5,27
2001/03	30690	-2,8	264961	16	5,8
2001/04	32564	-14	272335	29,3	5,2
2002/01	31397	-5,2	283674	17	5,13
2002/02	32888	9	302366	30,2	4,13
2002/03	34438	-2,4	313140	22,7	2,43
2002/04	36651	8,6	318085	28,6	0,7
2003/01	36264	8,8	317548	18,2	2,8

2003/02	37083	4,6	327704	30,7	5,2
2003/03	39086	5	337180	22,9	6,3
2003/04	40951	4	343334	25,3	7,63
2004/01	41397	-4,8	349754	19,3	7,6
2004/02	42886	5,2	362514	24,5	7,3
2004/03	45615	2,2	376711	22,3	6,37
2004/04	48654	0,4	387644	26,4	4,3
2005/01	48537	1,7	383580	22,9	4,6
2005/02	49879	-3,8	401386	26,9	3,8
2005/03	53908	0,8	422129	23,7	3,1
2005/04	57841	1,4	432159	26,4	3,3
2006/01	58938	4,9	426598	24,8	3,2
2006/02	60240	-6,1	444554	29,7	3,17
2006/03	66176	-7,5	480215	26,8	2,63
2006/04	71473	-0,2	488033	29,2	3,17
2007/01	73135	0,6	498348	29,2	3,1
2007/02	75062	2,2	512944	31	2,17
2007/03	78331	-1	539779	25,1	2,83
2007/04	80661	2	558431	32	2,27
2008/01	84250	-11,7	559861	27,6	1,1
2008/02	90666	-0,3	586568	32	-0,03
2008/03	98523	6,7	612848	27,1	-1,4
2008/04	103479	-11,8	609786	34,6	0,73
2009/01	90277	1,8	599460	28,9	2,1
2009/02	86519	13,5	616828	30,3	0,37
2009/03	83576	4,3	641246	25,5	0,77
2009/04	81770	0,9	650143	26,5	1
2010/01	83285	1,9	643223	23,1	1,13
2010/02	84722	3,4	687441	25,9	2
2010/03	86367	2,2	699616	20,6	2,83
2010/04	87143	1,1	717728	24,1	2,17
2011/01	87813	-3,1	720255	20,5	1,7
2011/02	91439	1	745456	27,2	0,9
2011/03	97969	-3,3	768208	19,8	0,1
2011/04	103189	-8,3	789740	26,6	-0,6
2012/01	96402	5,5	775014	21,1	-0,6
2012/02	102036	-2,7	811027	29,4	-0,3
2012/03	101025	0,2	825444	18,6	-0,1
2012/04	106536	-5,3	842485	24,2	-0,6
2013/01	103400	-2,2	844284	19,8	-0,7
2013/02	114975	-2,5	881161	25,9	-0,7
2013/03	123127	-2,8	903264	18,5	-1,2
2013/04	128988	-1,8	920444	25,1	-0,4
2014/01	116360	-4,4	919439	20,1	-0,4
2014/02	122072	5,5	941739	26,4	-0,9

2014/03	132563	0,4	966361	18,8	-0,45
2014/04	133959	1,3	985068	22,7	0,05
2015/01	125166	1,2	969912	19,4	0
2015/02	126844	0,4	995415	24,4	1,65
2015/03	134952	-3,5	1011076	17,4	1,15
2015/04	133392	-4,4	1037189	21,3	1,3