The nexus between Savings, Investment and Foreign Capital in South Africa: An Application of the Feldstein-Horioka Puzzle

By

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ABSTRACT

This study investigates the relationship between savings, investment and foreign capital in South Africa, with special focus on the application of the Feldstein-Horioka theory. South Africa is a country that is still faced with relatively low saving levels. Given the low savings experienced by the country, available literature has alluded that foreign capital has played a greater role as the major driver of private investment expenditure in South Africa. Based on this background, the study empirically investigates the relationship between savings, investment and foreign capital utilising the Autoregressive Distributed Lag Model estimation technique for the period 1965 to 2015. The empirical results revealed that there is a positive and significant relationship between savings and investment in South Africa. The empirical results also show that for the period 1995 to 2015, the different types of external financial flows utilized in the study and investment have a positive relationship. These results have been consistent with our apriori expectations and other prior studies. This suggests that, in the case of South Africa, apart from interest rates, there are other factors that determine investment. The positive relationship between investment and foreign capital flows suggest that policies which are aimed at attracting the different types of foreign financial flows should be implemented.

Keywords: Savings, Investment, Foreign Direct Investment, ARDL, South Africa

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LIST OF ACRONYMS AND ABBREVIATIONS

ARDL	Autoregressive Distributed Lag
CPI	Consumer Price Inflation
EU	European Union
FDI	Foreign Direct Investment
F-H	Feldstein- Horioka
GDP	Gross Domestic Product
OECD	Organization of Cooperation and Development
SADC	Southern African Development Community
SARB	South African Reserve Bank

CHAPTER 1

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION

It is generally accepted that foreign capital influence the course of the real economy, and this therefore accounts for the popularity of the subject of capital flows in academic and official policy discourse. Many studies have verified the crucial role of private capital flows in the promotion of economic performance. Borensztein *et al* (1998) argued that the existence of foreign capital inflows may boost local savings and also promote capital accumulation; hence implying that any limitations in private investment are minimized. However, the available studies in the area have provided conflicting views.

There are a number of studies which have highlighted that, even though foreign capital is of great importance to a developing country, it may weaken the relationship between savings and investment in a country. The work by Feldstein and Horioka (F-H) (1980) is one of the earlier studies which have been advanced to assess the savings-investment nexus. The authors investigated the correlations between savings-investment for sixteen Organization of Economic Cooperation and Development (OECD) countries. They found that, in countries where there are less capital controls, savings and investment are correlated, contrary to the apriori expectations in which it was expected that the link is weak. This has been referred to as the Feldstein-Horioka Puzzle. However, ever since the Feldstein and Horioka study, there are a number of studies which were further carried out to analyse the relationship between savings and investment in the face of an open capital account and conflicting results were obtained. For example, Ozman and Parmaksiz

(2003); Narayan (2005); Singh (2008) supported the F-H hypothesis, whilst on the other hand studies such as Narayan and Narayan (2010) and Ketenci (2012) were to the contrary. The ambivalence in the results from such studies has encouraged another strand of literature that has claimed otherwise, saying that savings have a correlation to investment due to other macroeconomic aspects such as the financial structure, current account dynamics and also the size of the country (Africa Development Bank, 2016).

There have also been arguments that the relationship between savings and investment is uninformative about capital mobility, as a vast number of factors could influence the relationship. Such factors include: business cycle which determines both savings and investment (Obstfeld and Rogoff, 1995); global shocks such as imported inputs and world interest rates that affect both savings and investment simultaneously (Baxter and Crucini, 1993); the response of government to the current account deficit through fiscal policy which makes public saving component align to investment (Summers, 1991).

The importance of investment to an economy has taken center stage given the important role it plays in determining economic growth (African Development Bank, 2016). This also is of great importance to South Africa given that the country has low levels of investment. As of 2015, investment as a percentage of GDP stood at 20% which is lower as compared to the 2008 level of 23.5%. There have been calls to also increase the level of investment if the country is to achieve a greater increase in economic growth (eNCA, 2014).

1.2 STATEMENT OF RESEARCH PROBLEM

The South African economy has experienced relatively low growth rates averaging around 2.5% for the past five years. The situation has been compounded by high levels of unemployment being experienced by the country. One of the important features of the economy which is similar to other countries has been calls to increase the level on investments in the country. However, the country has low levels of savings. South Africa's aggregate savings as a percentage of GDP as of 2011 stood at 16.6%, and although this compares favorably with Brazil (17.23%), it is still low as compared to other BRICS countries such as India (34.98%), China (52.78%) and Russia (33.76%). This also applies to other developing countries in Africa such as Nigeria (24.41%) and Botswana (26.15%) (Kapingura and Alagidede, 2016).

There are a number of studies such as Onafowara *et al* (2011) and Sanjib and Joice (2012) which indicates that savings are the major drivers of investment. Schmidt-Hebbel *et al (*1994) points out that understanding the link between savings and investment may hold the key to a positive correlation between growth and saving. In addition, if a country's focus is on capital accumulation as the major driver of the growth engine, then understanding the interaction between saving and investment becomes more important given the traditional thinking that when you raise savings you are increasing growth.

Given the low savings experienced by the country, foreign capital has played a greater role as the major driver of private investment expenditure in South Africa (Faulkner and Loewald, 2008 and Khumalo and Kapingura, 2014). The volume of FDI inflow between 2001 and 2010 amounted to 10 963 616 702 which was about 19.99% of GDP (World Bank, 2015), though the volume of FDI inflow decreased with about 10% between 2011 and 2014, to 9 879 939 802. The flow of foreign capital has been supported to a greater extent by the removal of a number of capital controls (for

example removal of the 3:1 ratio for non-residents when it comes to borrowing; relaxing the rules which govern corporate and institutional investors, with the aim of increasing capital flows, and also allowing resident companies to open foreign currency accounts).

However, there a number of studies based on the F-H hypothesis which supports that relying on foreign capital weaken the link between domestic investments and savings (Feldstein and Horioka, 1980; Ozman and Parmaksiz, 2003; Narayan, 2005 and Singh, 2008). The F-H hypothesis highlights that when an economy which is open to international capital flow, the savings rate and investment will not be equal given that the gap will be filled by capital flows. However, this will depend on whether the current account is in deficit or surplus. In the event that there is excess domestic savings over domestic investment, a country will be running a current account surplus. On the other hand, if domestic savings are less than domestic investment, the current account will be in deficit, with the country importing capital from the rest of the world. As a result, according to this hypothesis, opening up a country to capital flows weakens the relationship between investment and savings. This becomes important in the case of South Africa given that the country has liberalized capital accounts whilst at the same time the country has low levels of savings, in addition, investment levels cannot cope with the huge demand of employment levels. Thus the study seeks to examine if the capital flows have weakened the relationship between investment and savings in South Africa.

1.3 OBJECTIVES OF THE STUDY

The main objective of this study was to examine the relationship between savings, investment and foreign capital in South Africa.

The specific objectives of the study were:

i) To establish the trends on investment, savings and foreign capital in South Africa,

ii) Econometrically examine the effect of foreign capital on the savings-investment relationship in South Africa, and

iii)Based on empirical findings, determine the policy implications for the effect of foreign capital on the savings-investment relationship in South Africa

1.4 HYPOTHESIS TESTING

H_0: Higher capital mobility weakens the link between investment and savings.

H_1: Higher capital mobility does not weaken the link between investment and savings.

1.5 JUSTIFICATION OF THE STUDY

South Africa has engaged on policies aimed at liberalizing the capital account. These policies include increasing foreign capital for residents from R2 million to R4 million in 2009, increasing the amount a company is allowed to invest abroad to R500 million from R50 million, removing the 3:1 ratio for non-residents when it comes to borrowing. All these measures have increased the amount of capital into the country. At the same time it is important to note that the country is experiencing low levels of savings. Given the traditional thinking that domestic savings are the major drivers of investment, as well as their stability in the face of a crisis, it becomes important to establish the role foreign capital has played in the savings-investment relationship. The majority of studies in South Africa have largely claimed that capital flows are of great importance, however, there are no studies which have also examined how they may impact the link between investment and savings. Henceforth, this study will make a contribution in examining the link between investment, capital flows and savings in South Africa.

1.11 OUTLINE OF THE STUDY

The chapter outline for this dissertation will be as follows:

Chapter 1 - Introduction to the research issue to be investigated

Chapter 2 – Overview chapter(trends)

Chapter 3 - Theoretical and Empirical Literature Review

Chapter 4 - Research Methodology

Chapter 5 – Estimation & Interpretation of results

Chapter 6 – Conclusion & Policy Recommendations

CHAPTER 2

OVERVIEW OF SAVINGS, INVESTMENT AND FOREIGN CAPITAL IN SOUTH AFRICA

2.1 INTRODUCTION

Foreign direct investment (FDI) is regarded as being an important driver of economic growth in a country, especially for developing economies. However, the available empirical literature is not quite clear about the effect of FDI on the economic growth of a country. One study is saying that the country in question has to first reach a certain level of economic development for FDI inflows to be taken into consideration (Nunnenkamp, Schweickert and Wiebelt, 1997). However, South Africa has been experiencing declines in FDI inflows over the past few years. According to Bonga-Bonga and Guma (2017), in the case of South Africa, it is very much advisable to first focus on stimulating domestic savings for the purposes of boosting investment, while at the same time reducing the dependence on foreign capital. This leads to a vital question of how a higher domestic saving's rate can be achieved. Because gross domestic savings is divided into three components, government, household and corporate savings, increasing the level of aggregate savings will entail measures which require stimulation of one or all of these sub-components.

This chapter gives an overview and trends of savings, investment and foreign capital in South Africa. It is divided as follows: Section 2.1 is the introduction; Section 2.2 provides an overview of the key macroeconomic performance indicators in South Africa; Section 2.3 gives an overview of the trends in savings; Section 2.4 provides an overview of the trends in investment; Section 2.5 shows trends in foreign capital; and lastly Section 2.6 is the conclusion.

2.2 MACROECONOMIC PERFORMANCE INDICATORS IN SOUTH AFRICA

Table 2.1: Major Macro Economic Indicators in South Africa

Period	1980-1990	1991-2000	2001-2010	2011-2016
GDP growth (annual %)	2.24	1.81	3.55	1.88
GDP per capita growth (annual %)	-0.26	-0.64	2.24	0.32
Agriculture, value added (% of GDP)	5.46	4.44	3.12	2.4
Manufacturing, value added (annual % growth)	2.41	1.14	2.53	1.13
Industry, value added (annual % growth)	1.35	0.67	2.38	0.66
Services, etc., value added (annual % growth)	2.50	2.99	3.82	2.51
Exports of goods and services (annual % growth)	1.47	5.26	1.57	2.49
Gross capital formation (annual % growth)	1.63	2.61	6.99	2.11
Gross capital formation (% of GDP)	23.43	18.25	18.63	20.32
Current account balance (% of GDP)	0.00	0.00	-2.99	-4.37
Foreign direct investment, net inflows (% of GDP)	0.01	0.67	2.08	1.22
Total reserves in months of imports	0.00	0.00	2.30	4.59

Source: World Bank Development Indicators (2016)

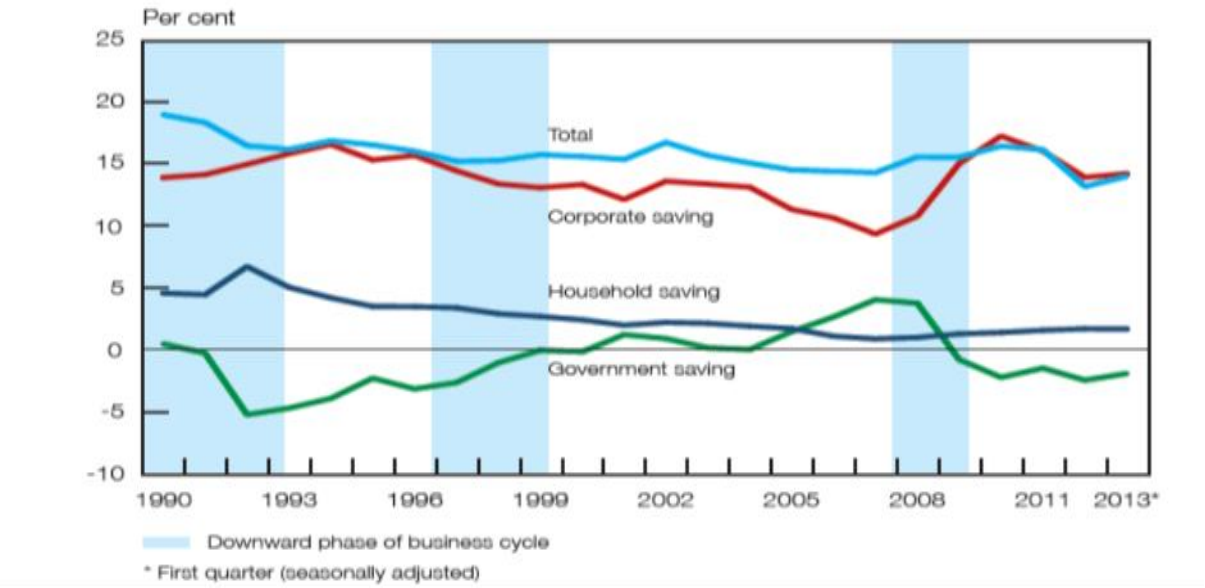
Table 2.1 indicates that from 1990-2000 and 2001-2010, there was an increase in GDP growth rate from 1.8% to 3.55%, a 1.74% increase. There was also an increase in GDP per capita, manufacturing, industry, services and foreign direct investment which have increased by 2.88%, 1.39%, 1.71%, 0.83%, and 1.41%, respectively. This rapid economic growth after 1994 is due to the structural transformations undergone by the South African authorities. These transformations

include the implementation of policies by the authorities which wanted to promote domestic competitiveness, growth and employment, and increase the outward orientation of the economy. Due to this, the country has experienced macroeconomic stability. This is shown by the 62 quarters of uninterrupted rapid economic growth between the period 1994-2007 when the country was also affected by the global financial crisis. The main sectors which contributed to this rapid economic growth are mining, manufacturing, wholesale, finance, and general government services amongst others, as shown by Table 2.1. However, during the period 2011-2016, there was a sharp decline in GDP growth rate to 1.88%. Also, South Africa's economy has been criticised for failing to combat the very high levels of unemployment which currently stand at 27.7%. For the period 2011-2016, South African economy was faced with adverse economic conditions due to a decrease in the economic growth of the country. For instance, there was a decline in GDP per capita, manufacturing, industry, services and foreign direct investment to 0.32%, 1.13%, 0.66%, 2.51%, and 1.22%, respectively.

2.3 TRENDS OF SAVING IN SOUTH AFRICA

For the past decades, there has been a decline in the national savings rate in South Africa (Harjes and Ricci, 2006). This has in turn led to a decline in investment. According to Figure 2.1 below, from 1990-1999 the national saving ratio was 16.5%, however this rate declined to 15.2%, indicating a 1.3% decrease. The figure below shows different components of domestic saving. Household and government saving has declined drastically in South Africa. However, corporate saving is positive and therefore has taken a much more important role in South Africa (Luüs, 2007).

Figure 2.1: Gross Savings as a percentage of Gross Domestic Product (1990- 2013)



Source: South African Reserve Bank (2014)

By making use of data from the South African Reserve Bank (SARB), Luüs (2007) has revealed that during the 1960s, net household saving was an average of 6.9% GDP in South Africa. But, there was a rapid decline by 1% to 5.9% in the 1970s, 3.2% in the 1980s, and 1.7% in the 1990s. Net household saving was 0.8% in 2008, but this declined to 0.1% during the year 2005. Net household saving was at its highest in 1972 and constituted 12.4% of household disposable income, but in 2006, it was 0.3%. However, during the 1960s, net corporate saving was on average 2.6% of gross domestic saving, 4.3% in the 1970s, 6.6% in the 1980s, 5.6% in the 1990s, and around 3.7% during the six years up to 2005.

It is of paramount importance to take note of the fact that in the 1980s South Africa's gross national savings was very much better as compared to other developed countries. For instance, South Africa had 24.3% in gross national savings whereas the United Kingdom and the United States had 16.5% and 15.5%, respectively (Luüs, 2007).However, South Africa's position has rapidly declined, for

example, in the 1990s, it was only 16.6% and this deteriorated to 14.5% during the year 2005. There was also a decline of 0.7% in 2006 to 13.8% of GDP. This rapid decline over the past years was due to the increase in consumption expenditure. This is due to the tax relief, decrease in the levels of inflation, reduction of interest rates, and the wealth effect of escalating asset prices such as property prices and equity values in the past (Luüs, 2007). This means that consumers have been spending a lot and saving a little.

There was a decrease in South Africa's national saving rate in the third quarter of 2016. Measured as a percentage of GDP, it decreased from 16.7% in the second quarter to 16.4% in the third quarter, a 0.3% decrease. This decrease in the saving rate is attributed to the decline in the household and government saving levels, whereas on the other hand corporate saving was actually picking up over the same period (SARB, 2016).

Gross saving by the corporate sector as a percentage of GDP increased by 1% from 13.6% to 14.6% in the third quarter of 2016. This was attributed to the increase in the gross operating surpluses of business enterprises in the third quarter as well as the subdued dividend and tax payments over the period. However, it is important to take note of the fact that during the first quarter of 2015, there was a sharp decline in the corporate saving rate from 16.4% to 13.4% showing a 3% decline (SARB, 2016).

Government saving rate declined from 1.9% of GDP during the second quarter of 2016 to 0.8% in the third quarter. There was a partial increase in aggregate government income in the third quarter of 2016, because a rise in value-added tax received fully offset a decline in company tax over the period. In the fourth quarter of 2016, there was growth in consumption expenditure by the government and this contributed to the lower saving performance (SARB, 2016). There was also

a slight decrease in gross household saving as a percentage of GDP from 1.2% in the second quarter of 2016 to 1.1% in the third quarter (SARB, 2016).

2.3.1. Consumption expenditures by household and government

2.3.1.1 Final consumption expenditure by households

There was an increase in the real final consumption expenditure by households from 1.4% in the second quarter of 2016 to 2.6% in the third quarter. A rapid increase on the spending of non-durable goods and services while there was a moderation in growth of semi-durable goods was observed. On the other hand, expenditure on durable goods decreased further over the same period. Even though there was a decrease in real household spending for the first quarter of 2016, level of real spending by households was still 0.9% higher in the first three quarters of 2016.

Table 2.2: Real final consumption expenditure by households

Percentage change at seasonally adjusted annualised rates

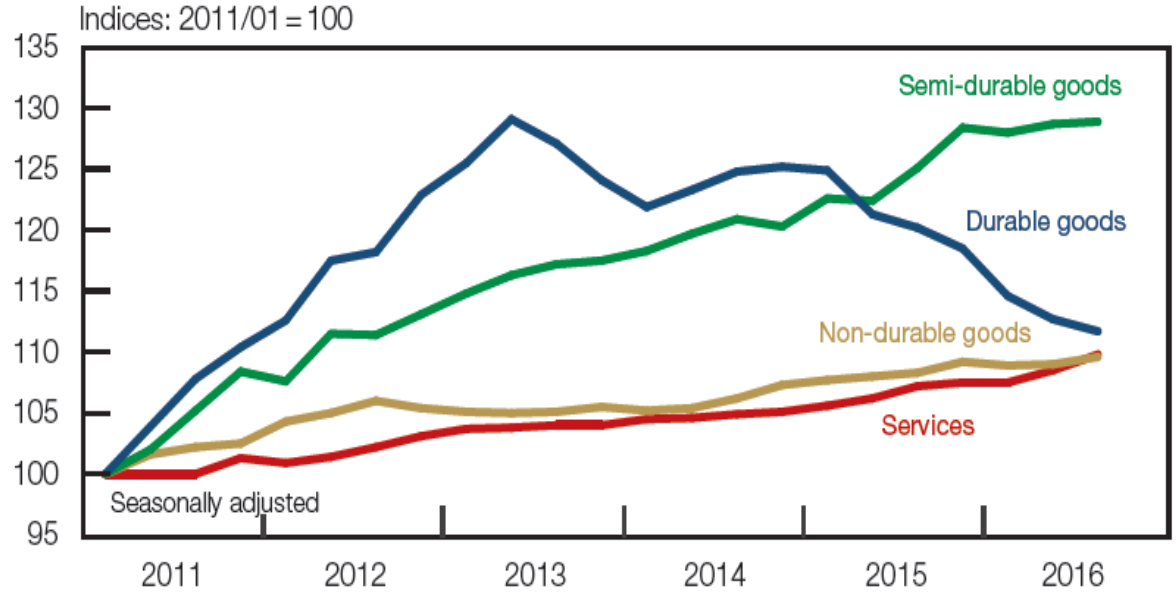
Category	2015					2016		
	1st qr	2nd qr	3rd qr	4th qr	Year	1st qr	2nd qr	3rd qr
Durable goods.....	-1,1	-11,0	-3,6	-5,5	-2,1	-12,5	-6,4	-3,8
Semi-durable goods.....	8,0	-0,5	8,9	11,1	4,0	-1,2	2,1	0,6
Non-durable goods	1,5	1,3	1,1	3,1	2,2	-0,9	0,4	2,3
Services	1,9	2,4	3,6	1,1	1,8	0,1	3,8	4,7
Total.....	2,0	0,3	2,4	2,1	1,7	-1,7	1,4	2,6

Source: South African Reserve Bank (2016)

Table 2.2 indicates that there was a continued decline in the real outlays by households on durable goods for the third quarter of 2016. Real spending on durable goods declined by 3.8% during the third quarter of 2016. There was a continued decline in the demand for durable goods because of the low level of economic activity, subdued growth in credit extension and relatively lower

consumer confidence levels (SARB, 2016). Expenditure on semi-durable goods rapidly declined from 2.1% in the second quarter of 2016 to 0.6% in the third quarter.

Figure 2.2: Components of real final consumption expenditure by households



Source: South African Reserve Bank (2016)

Figure 2.2 shows that the real expenditure by households on non- durable goods increased from 0.4% in the second quarter of 2016 to 2.3% in the third quarter. This was attributed to the expenditure by households on food, beverages and tobacco. Real expenditure on services relatively increased from 3.8% in the second quarter of 2016 to 4.7% in the third quarter. This increase in spending was attributed to the spending on miscellaneous services.

2.3.1.2 Final consumption expenditure by government

Real final consumption expenditure by government increased by 0.7% from 1.4% in the second quarter of 2016 to 2.1% in the third quarter. This increase was attributed to the temporary hire of additional staff and spending which was incurred by the Independent Electoral Commission (IEC)

during the period of municipal elections in August 2016. When we compare South Africa to other emerging countries, it has been lagging behind as far as gross domestic savings as a percentage of GDP is concerned, this being shown by the Figure 2.3 below. Utilising data from the World Bank, during the period 2011-2016 the average savings rate in South Africa was 19.37% as compared to 49.65% for China, 31.13% for India and 29.22% for Russia. However, South Africa is still better than the 18.45% for Brazil.

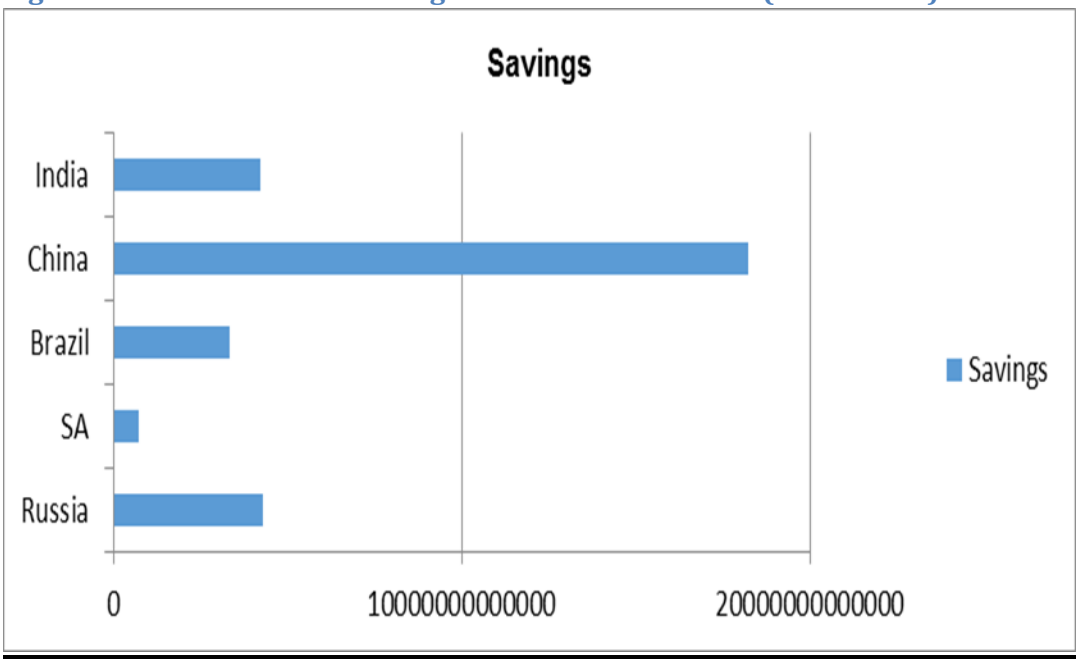
Table 2.3: Gross Domestic Savings % of GDP (2011–2016)

Countries	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
South Africa	20.53	18.51	18.87	19.10	19.62	19.56
Brazil	21.06	20.06	19.39	17.89	16.43	15.81
China	50.07	49.94	49.83	49.52	48.89	
India	33.05	31.62	31.04	31.57	30.59	28.92
Russia	31.23	29.72	26.75	28.65	30.44	28.56

Source: World Bank Development Indicators (2016)

South Africa is still lagging behind other BRICS countries in terms of its gross savings. As shown by the Table 2.3 below, South Africa's gross saving was $792 986 million whereas for Brazil it was $3 793 532 million, $4 206 519 million for Russia and $18 232 409 million for China.

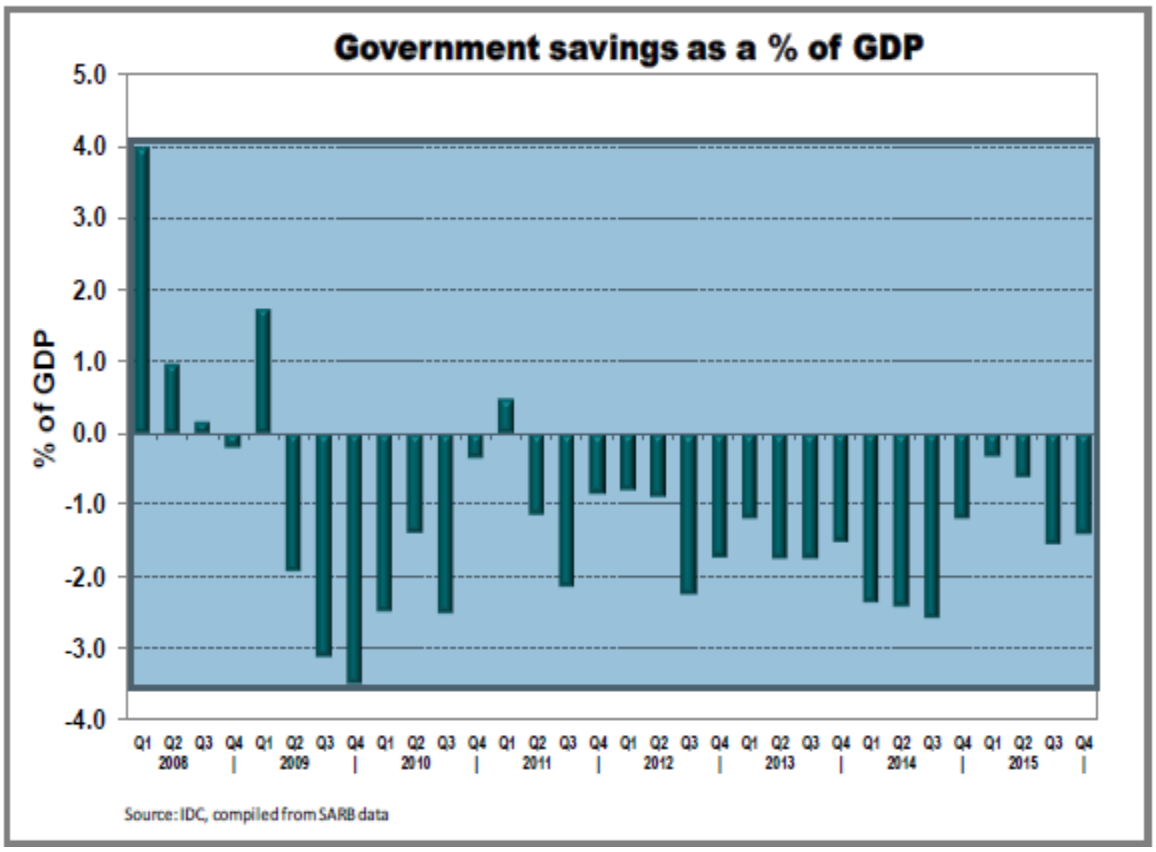
Figure 2.3: Gross National Savings from BRICS Countries (1990–2013)



Source: World Bank Development Indicators (2013)

These low levels of savings for South Africa signal a warning for the country given the fact that domestic savings are the ones which provide money for the purposes of financing domestic fixed capital formation.

Figure 2.4: Government savings as a percentage of GDP (2008-2015)



Source: Industrial Development Corporation (2016)

Over the past few years, the South African government has spent more than it has actually been earning. This is evidenced by the Figure 2.4 above whereby government dissaving was R38.7 billion which is about -1.1% of GDP in 2015, as compared to the R80 billion in 2014. Because of the continued dissaving by the government and households which is about -2.3% of GDP, this has led to the government being highly reliant on the domestic corporate sector and foreign capital inflows in order to finance this shortfall.

2.4 TRENDS OF INVESTMENT: COMPARISON BETWEEN SOUTH AFRICA AND OTHER REGIONS

Table 2.4: Key trends in investment (2007-2015)

FDI flows (Millions of Dollars)	**2005-2007 (pre-crisis annual average)**	**2012**	**2013**	**2014**	**2015**
South Africa					
Inward	4 499	4 559	8 300	5 771	1 772
Outward	3 320	2 988	6 649	7 669	5 349
Memorandum					
Angola					
Inward	- 745	- 6 898	- 7 120	1 922	8 681
Outward	441	2 741	6 044	4 253	1 892
Nigeria					
Inward	5 321	7 127	5 608	4 694	3 064
Outward	404	1 543	1 238	1 614	1 435
Southern Africa					
Inward	5 952	8 101	11 036	17 540	17 900
Outward	3 731	5 126	12 669	11 772	6 824

Africa					
Inward	38 169	55 156	52 154	58 300	54 079
Outward	6 931	12 386	15 543	15 163	11 325
Developing economies					
Inward	420 086	658 774	662 406	698 494	764 670
Outward	194 923	357 844	408 886	445 579	377 938
World					
Inward	1 418 164	1 510 918	1 427 181	1 276 999	1 762 155
Outward	1 445 276	1 308 820	1 310 618	1 318 470	1 474 242

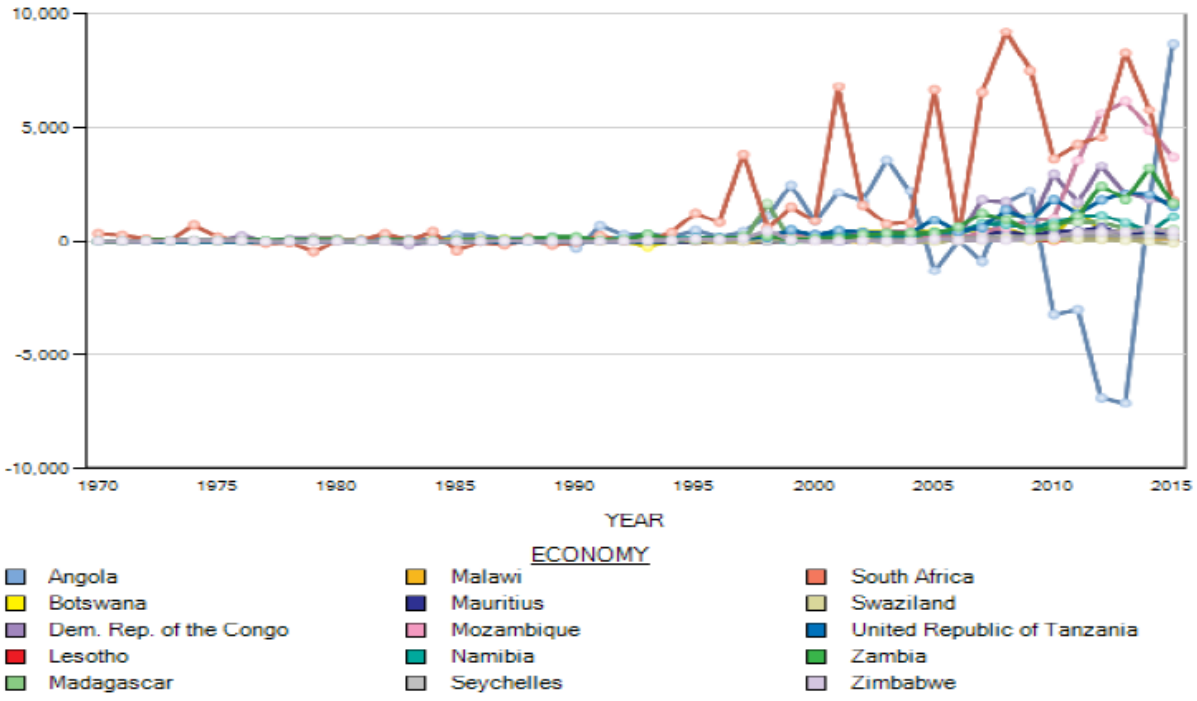
Source: United Nations Conference on Trade and Development (UNCTAD) (2016)

A positive correlation exists between low income countries and low levels of infrastructure and investment levels. This means that the lower income will automatically lead to lower levels of infrastructure which will then hinder economic growth in a country. According to online data provided by UNCTAD, foreign direct investment in South Africa (SA) declined from US$8 300 million in 2013 to US$1 772 million in the year 2015. This shows a significant decline in growth by 78.7% in two years. However, there has been growth in FDI experienced by the overall SADC region by a significant 63.3% from US$11.0 billion to almost US$18.0 billion over the same period. The significant decline in growth raises a huge concern with regards to investor confidence in the country in the sense that foreign investors do not view South Africa as a conducive environment to invest in. This may be attributed to the ongoing political unrest in the country.

However, for the year 2016 South Africa's FDI inflows increased by 38%, but this increase is attributed to the increase in portfolio investments (UNCTAD, 2017). It is vital to take note of the fact that South Africa is still better than its other regional counterparts when it comes to attracting FDI. Figure 2.5 below shows the trends in FDI in the SADC region from 1970-2015.

Figure 2.5 shows that the trend for inward FDI in South Africa is on the rise after 1994 as compared to other countries in the SADC region. As already noted above, for the year 2015 South Africa's FDI inflow has been decreasing, but despite this South Africa still remains amongst the top as far as FDI attraction in the region is concerned (UNCTAD, 2016).

Figure 2.5: FDI trends in the SADC region



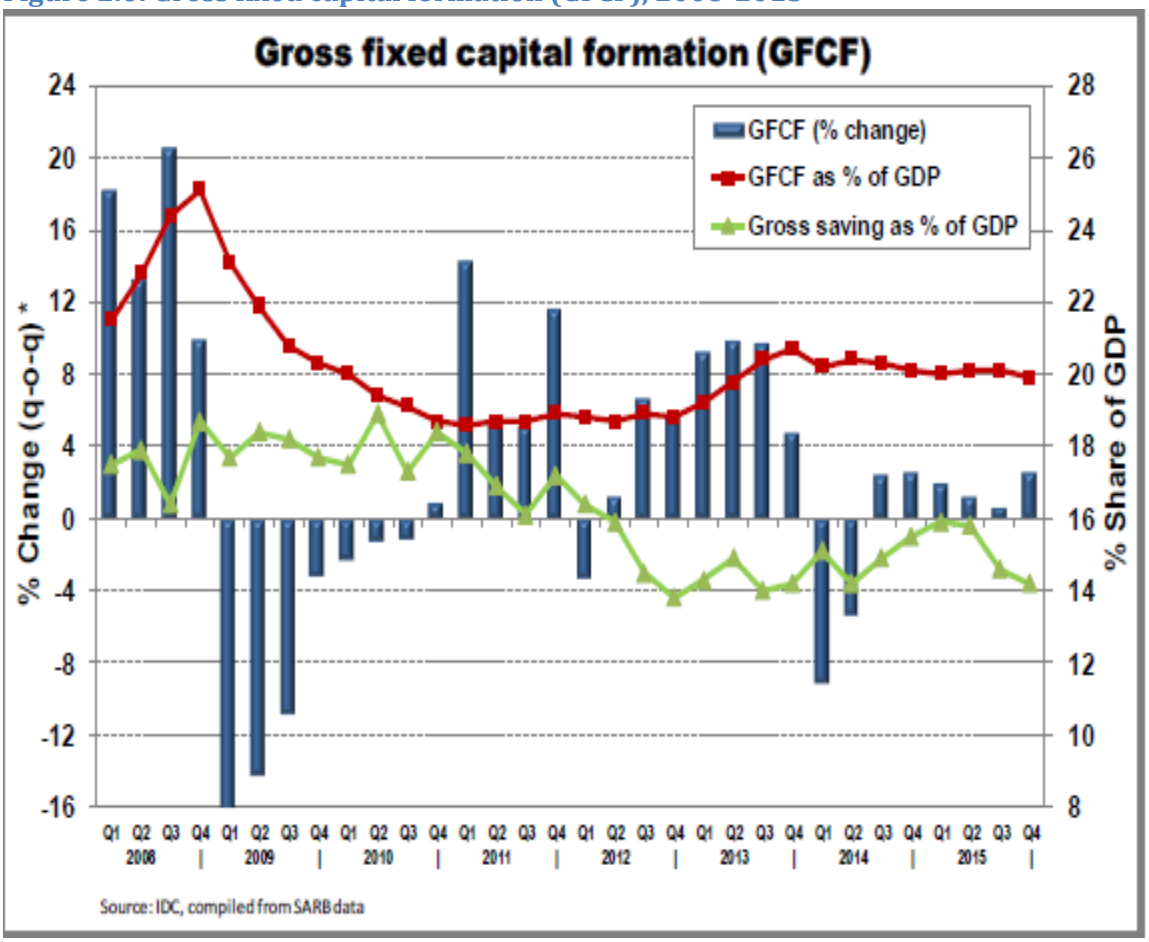
Source: UNCTAD (2016)

Globally, the foreign direct investment (FDI) inflows totalled US$1.43 trillion in 2013, rising gradually to US$1.77 trillion in 2015. This represents a 23.8% increase, comparatively less than

the 63.3% increase within the SADC region over the same period. The relatively higher growth rate in FDI inflows shows the growing share of FDI within the SADC region, which asserts the region's current and future potential to attract foreign investment and therefore stimulate economic growth.

2.5 TRENDS OF FOREIGN CAPITAL IN SOUTH AFRICA

Figure 2.6: Gross fixed capital formation (GFCF), 2008-2015

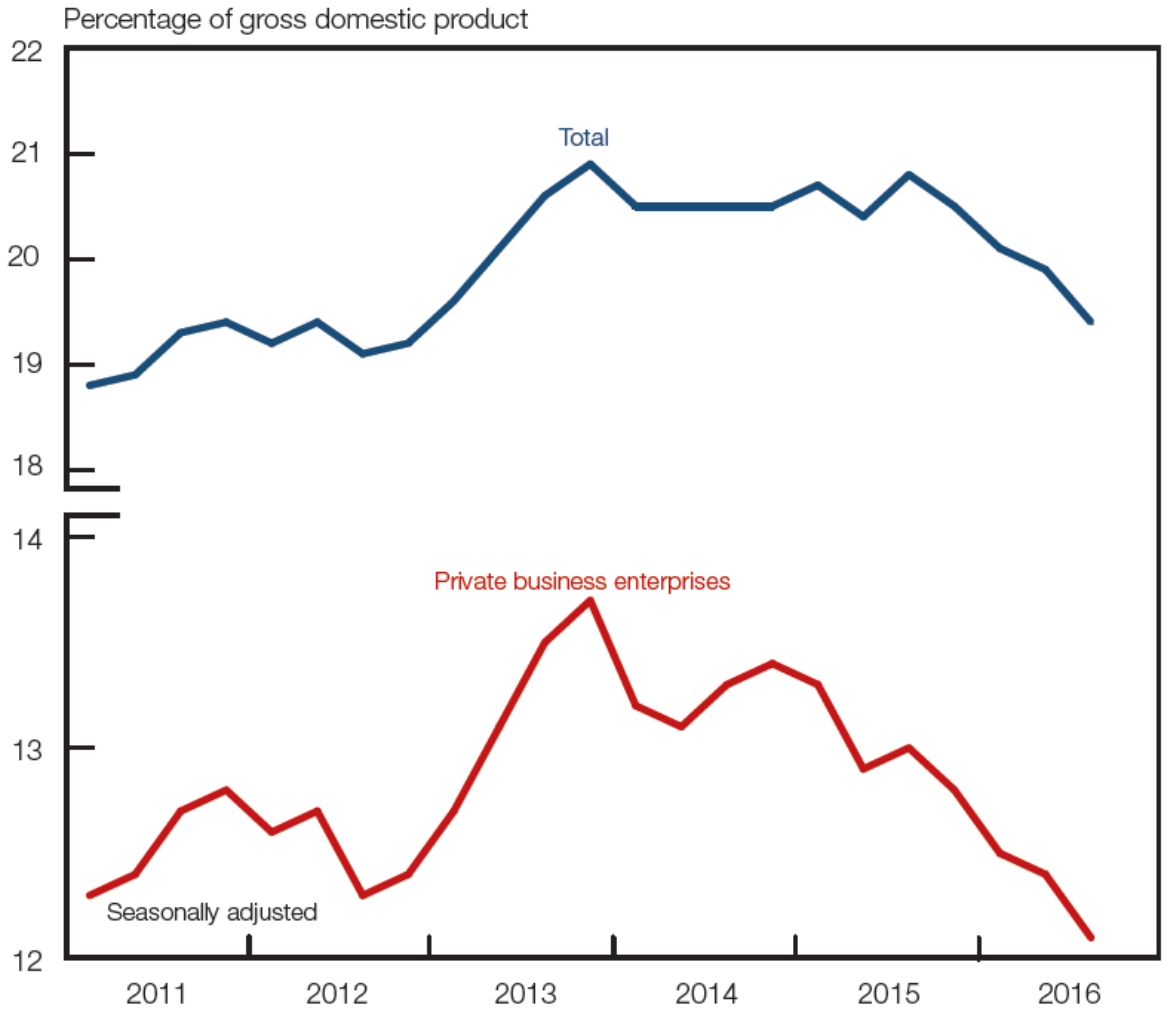


Source: Industrial Development Corporation (2016)

According to the Figure 2.6 above, there was some sort of recovery in fixed investment activity during the year 2015, increasing by 1.4% as compared to the decrease in 2014 by 0.4%. However,

this slow rate of increase is a clear indication of the challenges faced by the business sector in terms of trading conditions and operational tasks.

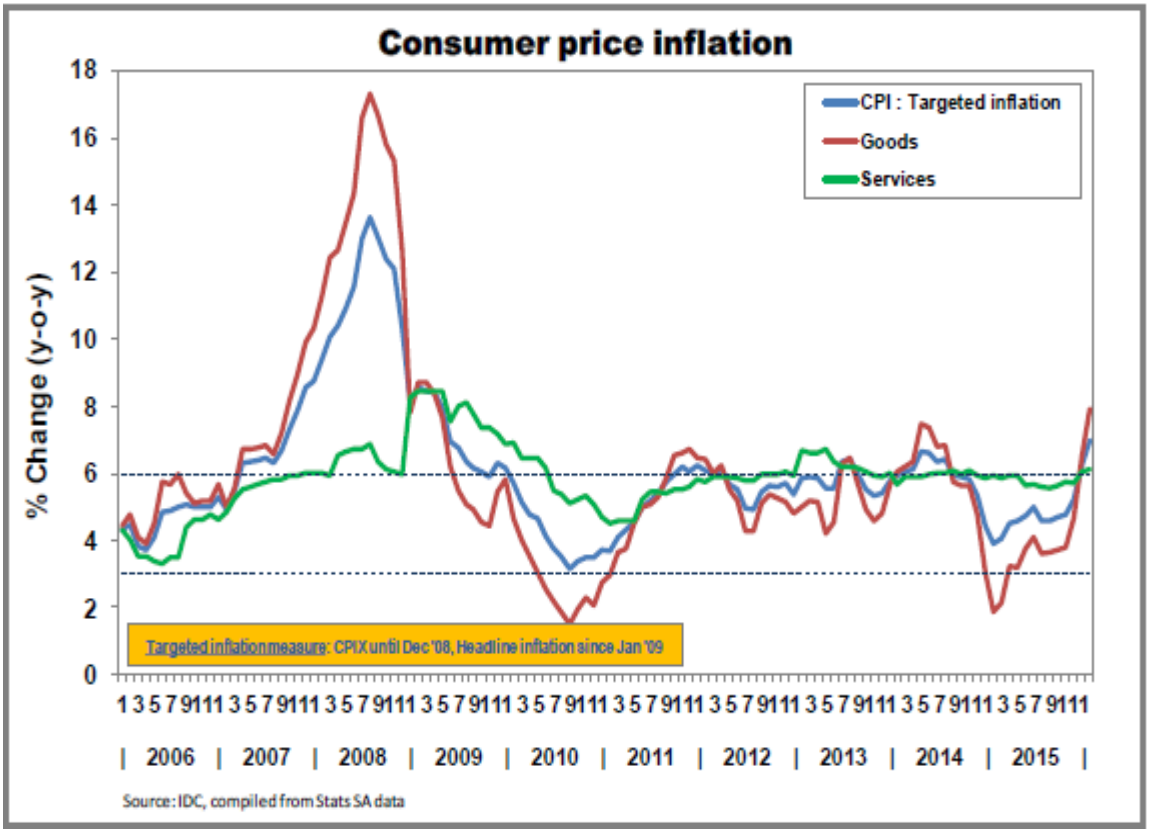
Figure 2.7: Gross fixed capital formation



Source: South African Reserve Bank (2016)

However, for the third quarter of 2016 as indicated on Figure 2.7, there was a decline in the gross fixed capital formation. Having decreased on an annualised rate of 6.8% in the second quarter of 2016, the real capital outlays decreased at a rate of 1.0% in the third quarter. Gross fixed capital formation slightly declined from 20.5% at the end of 2015 to 19.4% in the third quarter of 2016.

Figure 2.8: Consumer Price Inflation (2006-2015)

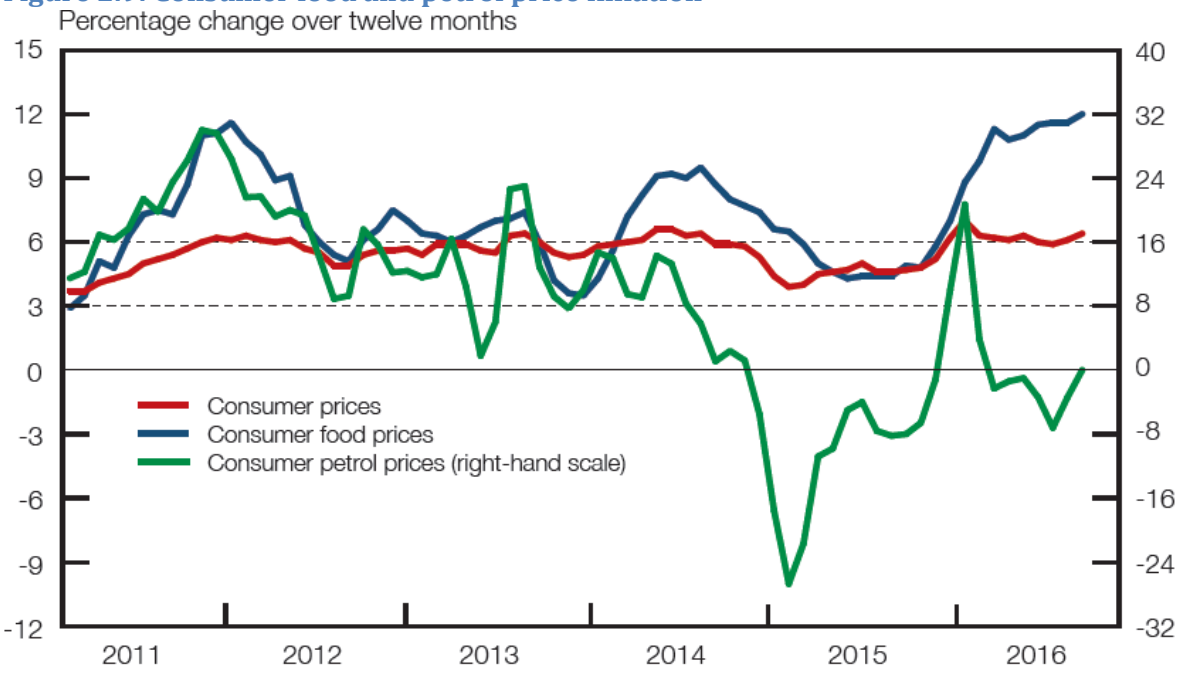


Source: Industrial Development Corporation (2016)

For the year 2015 as shown in Figure 2.8, Consumer Price Inflation (CPI) decreased by 1.5% to 4.6% from 6.1% which was recorded in 2014. This is attributed to the rapid decline in commodity prices, more especially crude oil, together with good harvest during the season of 2013/14, which curbed food price inflation (IDC, 2016). However, due to the severity of drought conditions in most parts of South Africa had a negative impact on the agricultural output of the country, leading to higher food inflation rates during the beginning of 2016, reaching 8.8% in February.

Due to the weaker Rand and the recovery in oil prices in early 2016, there was an increase in fuel inflation to 20.7% in February, as compared to the rapid decline of 10.5% in 2015 as shown in Figure 2.9.

Figure 2.9: Consumer food and petrol price inflation



Source: South African Reserve Bank (2016)

In February 2016, the headline consumer price inflation was 7.0%, however, it declined to 5.9% in August, and this is within the inflation target range of 3 to 6%, a first since December 2015. This decline was attributed to the deceleration in petrol price inflation and also a slowdown in consumer services price inflation. However, the headline consumer price inflation increased again in September 2016 because of an increase in petrol and durable goods price inflation (SARB, 2016).

Consumer goods price inflation moderately declined from 7.9% in February 2016 to 6.1% in August, non-durable goods' price inflation simultaneously also declined rapidly from 9.6% to 6.1% over the same period. This decline in non-durable goods' price inflation is attributed to the reversal of the petrol price inflation from 20.7% in February 2016 to -7.2% in August, because of

the stable international crude oil prices and a less depreciated exchange value of the rand. Consumer goods' price inflation increased to 7.1% in October 2016 due to the quickening in petrol and food price inflation (SARB, 2016).

2.6 CONCLUSION

This chapter provided a broader understanding of the relationship between as well as an overview of the trends in savings, investment and foreign capital in South Africa. The chapter shows that South Africa still comes out top when it comes to attracting FDI, even though there was a decline in 2015. However, the country still has low levels of savings with government savings being negative. This becomes increasingly worrisome that the population spends more than it can save and also given the fact that domestic savings are actually the ones which provide money to finance the domestic fixed capital formation.

CHAPTER 3

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

3.0 INTRODUCTION

The chapter presents a review of both the empirical and theoretical literature which examined the relationship between savings, investment and foreign capital. The chapter is made up of two major sections. The first section focuses on the theoretical link between savings, investment and foreign capital, and the second section reviews the available empirical literature on this area.

3.1 Theoretical Review

Theories have been put forward to explain the nexus between savings, investment and foreign capital. Of the available theories, the study will focus on the Feldstein-Horioka model, the National Accounting Identity, and the Harrod-Domar model. These theories were chosen based on their explanation of the link between savings, investment and foreign capital.

3.1.1 THE FELDSTEIN AND HORIOKA MODEL

A vital model which has been invented to explain the role of financial flows on the link between savings and investment is the Feldstein and Horioka model which was suggested by Feldstein and Horioka (1980). This model argues that the correlation between investment and savings becomes high given that there are low levels of capital mobility. This model suggests that in a closed economy that has low capital mobility; domestic savings will finance all of the investment. However, in an open economy allowing the free flow of capital, domestic savings will not necessarily be utilised to finance domestic investment as savings can be used to get better returns around the world. Putting it in the words of Feldstein and Horioka (1980:317),

"*there should be no relation between domestic savings and domestic investment: savings in each country responds to the worldwide opportunities for investment while investment in that country is financed by the worldwide pool of capital*".

Therefore, according to this model, foreign capital will not compliment the domestic savings and hence will not be in support of investment in the domestic economy. According to the F-H model foreign capital basically weakens the link between domestic savings and investment. The F-H model is one of the earlier studies which have been advanced to assess the savings-investment nexus. The authors investigated the correlations between savings-investment for sixteen Organization of Economic Cooperation and Development (OECD) countries and found that in countries where there are less capital controls, savings and investment are correlated, contrary to the apriori expectations in which it was expected that the link is weak. This has been referred to as the Feldstein-Horioka Puzzle (African Development Bank, 2016). After making use of cross-sectional analysis for the period 1960-1974, 80% in the OECD countries were changed into domestic investment and the investment coefficient was statistically not different from zero. This showed that there was capital immobility even though there were loosened capital controls (African Development Bank, 2016).

Ever since the research which was done by Feldstein and Horioka (1980), many other researchers have tried to solve this puzzle. However the more effort they put into solving it the more the puzzle became controversial. This controversy has led to many trying to justify or be against the Feldstein Horioka analysis by utilizing different methodologies and method of analyses. Some have made use of cross-section analysis to investigate capital mobility, utilizing saving-investment correlations, while on the other hand some were against the use of cross-section analysis. They put forward arguments such as that cross-section analysis suffers from the problem of selection bias.

Regardless of such arguments, these studies make an assumption that savings-investment correlations imply that capital is either mobile or immobile which is dependent on the magnitude and size of correlation between savings and investments (African Development Bank, 2016).

However, ever since the Feldstein and Horioka study, there are a number of studies which were further carried out to analyse the relationship between savings and investment in the face of an open capital account and conflicting results were obtained. For example Ozman and Parmaksiz (2003); Narayan (2005) and Singh (2008) supported the F-H hypothesis, whilst on the other hand studies such as Narayan and Narayan (2010) and Ketenci (2012) were to the contrary. The ambivalence in the results from such studies has encouraged another strand of literature that has claimed otherwise, highlighting that savings have a correlation to investment due to other macroeconomic aspects such as the financial structure, current account dynamics and also the size of the country (Africa Development Bank, 2016).

There have also been arguments that the relationship between savings and investment is uninformative about capital mobility, as a vast number of factors could influence the relationship. Such factors include: business cycle of which it determines both savings and investment (Obstfeld and Rogoff, 1995); global shocks such as imported inputs and world interest rates that affect both savings and investment simultaneously (Baxter and Crucini, 1993); the response of government to the current account deficit through fiscal policy which makes public saving component align to investment (Summers, 1991).

However, there are a number of studies based on the F-H hypothesis which support that relying on foreign capital, weaken the link between domestic investments and savings (Feldstein and

Horioka, 1980; Ozman and Parmaksiz, 2003; Narayan, 2005; and Singh, 2008). The F-H hypothesis highlights that an economy which is open to international capital flow, the savings rate and investment will not be equal given that the gap will be filled by capital flows. However, this will depend on whether the current account is in deficit or surplus. In the event that there is excess domestic savings over domestic investment, a country will be running a current account surplus. On the other hand, if domestic savings are less than domestic investment, the current account will be in deficit, with the country importing capital from the rest of the world. Hence, according to this hypothesis, opening up a country to capital flows weakens the relationship between investment and savings. Given these different choices of methodologies and methods of analyses which contradict each other, the Feldstein Horioka puzzle has since remained a puzzle unsolved.

3.1.2 NATIONAL ACCOUNT IDENTITES

The relationship between savings and investment is expressed through the national account identities which say that in a closed economy national income and output are equal. This can be expressed as:

$$Y \equiv C + S + T = C + I + G \quad (3.1)$$

Where C represents consumption, S is private saving, T is taxes, I is investment, and G is government spending.

Equation (1) above can be rearranged as:

$$S + (T - G) = I \quad (3.2)$$

Savings are the difference between what is earned and also what is consumed. Therefore, from equation (2) above, it is clear that domestic investment is equal to private savings (S) plus

government savings (T – G). Government savings are include the private savings so as to provide us with national savings(S). We can now express equation (2) as:

$$S = I \quad (3.3)$$

Therefore, the level of investment is restricted by the level of national savings.

In an open economy, exports (X) and imports (M) are included in the national accounts identities which become:

$$S - I = X - M \quad (3.4)$$

According to equation (4) above, in an open economy, the remainder between what a country saves and invests is equal to the balance on the current account of the Balance of Payments. Countries which save less and invest more will have a current account deficit. This deficit can be sustained by exhausting the foreign exchange reserves or through foreign capital inflows (Prinsloo, 2000:2). Therefore, in the open economy model, the level of investment is restricted by the level of domestic savings plus foreign capital inflows. This suggests that countries can grow faster than the rate determined by their level of savings, given that they can attract foreign capital inflows (Mngqibisa, 2014).

3.1.3 HARROD-DOMAR MODEL

The Harrod-Domar Growth Model is quite a simple model which suggests that changes in national income ΔY are linearly dependent on changes in capital stock ΔK and that investment or changes in capital stock is financed out of domestic savings S in the closed economy version of the model, that is $\Delta K = S$. The model alludes that domestic savings *S* are dependent on national income Y, that is $S = sY$, where *s* is the saving ratio of income:

$$\Delta Y = b\Delta K \quad (3.5)$$

$$\Delta K = S = sY \quad (3.6)$$

When we substitute (2) into (1), we have:

$$\Delta Y/Y = sb \quad (3.7)$$

Harrod-Domar provided an explanation that equilibrium economic growth is determined by the product of savings ratio *s* and annual investment returns (Ojapinwa and Odekunle, 2013). This means that economic growth will move at the rate at which society can mobilise the resources of domestic savings coupled with the productivity of investment. Becoming fully aware of the fact that the major constraint on the part of developing economies is the shortage of capital, the Harrod-Domar model prescribed the open extension where investment can be financed both by the domestic and the foreign capital flow (emphasis being on remittance) (Ojapinwa and Odekunle, 2013). Then we can write the model as:

$$\Delta Y = b\Delta K \quad (3.8)$$

$$\Delta K = S + F \quad (3.9)$$

When substituting (4) into (5) and dividing through Y, we then have

$$\Delta Y/Y = b[(S/Y) + (F/Y)] \quad (4)$$

$$\Delta Y/Y = b[s + f] \quad (4.1)$$

This suggests that if f >0, then economic growth can be expanded beyond what the domestic savings resources will allow (Ojapinwa and Odekunle, 2013).

"The approaches by Harrod and Domar (1946) begin from a fundamentally Keynesian framework and extend to the long run, analysing the requirements for maintaining full employment over time" (Hagemann, 2009:69). According to the Harrod-Domar model, in order to maintain full employment, the economy has to invest the amount of saving related to full-employment income every year; but even that alone is not enough. The production capacities have to be fully used as well, and capital accumulation has to be synchronized with the growth of the labour force. At first, "Keynes' peculiar treatment of investment" (Domar 1957:6) had to overcome and the dual character of the investment process had to be taken into consideration. This therefore suggests that investment not only generates income as in the Keynesian multiplier analysis, but also increases the economy's productive capacity. Whereas the first effect becomes visible on the demand side and is of a short-run nature, the latter effect is visible on the supply side and is a long-run effect (over the lifetime of the capital goods). Furthermore, whereas every positive net investment *I* has a capacity-enhancing effect, only an increase of investment *I* leads to an increase in income *Y* (Hagemann, 2009).

3.2 Empirical Literature Review

There are many studies which have tried to solve the F-H puzzle by examining its feasibility either theoretically, empirically, or both in different countries. Some studies only focused on developing and Asian countries. Sinha (2002) studied 12 Asian countries and found out that there was co-integration between saving and investment rates only in three countries without taking into account structural break and these increased to four when accounted for structural break. The study further shows that the growth of saving Granger leads to the growth of investment in five countries while the reverse causality was found in six countries. In addition, Sinha and Sinha (2003) studied the short-run and long-run relationships between savings and investment rates in 123 countries utilising an error correction framework. They found that capital was mostly mobile in 16 countries

which have low per capita income. This finding is against the conventional wisdom that capital is more mobile in countries that have high per capita income.

In China, Narayan (2005) found that there were correlations between savings and investment for two sample periods of 1952-1994 and 1952-1998, but the correlation was at its highest in the first period with fixed exchange rate. Narayan (2005) reached a conclusion that the Chinese economy is in conformity with the F-H hypothesis of low capital mobility during fixed exchange rate regime. For the United States, Miller (1988) making use of data from 1946-1987 found that there was co-integration between savings and investment rates during the period of fixed exchange rate (before 1971), but not during the subsequent period because of increased international capital mobility. Pollin and Justice (1994) also found out that there was no co-integration between savings and lending rates on the US quarterly data and suggested high capital mobility.

In the case of Japan, Yamori (1995) and De Vita Abbott (2002) utilising an ARDL bounds testing procedure found that there was lack of co-integration between savings and investment rates and showed high capital mobility. For Nigeria, Nasiru and Usman (2013) also made use of the ARDL bounds testing approach to co-integration so as to test for the long-run relationship between savings and investment in Nigeria from 1980-2011. They found support for the F-H hypothesis. Artis and Bayoumi (1989) and Koskela and Viren (1991) explained that government's targeting of current account is responsible for the correlation of saving-investment while Roubini (1988) says that it is due to a public sector which follows policies that are conducive to smoothen taxation.

Adey (2003) tested the F-H hypothesis taking into account 21 OECD and EU countries from 1970–2000, and utilising a simultaneous equation model and panel estimation techniques and supported it. Bebezuk and Schmidt-Hebbel (2006) utilised data from 16 OECD countries between the period

of 1973-2003, with sector level economic regression, done by dividing the country into household, corporation and government data. They found a β coefficient that is equal to 0.5, but once the sectoral coefficients are taken into account, β gets close to zero, which shows a high degree of capital mobility. Caporale, Panopoulou and Pittis (2007) utilized data from 23 OECD countries, and found 'little' evidence supporting the F-H hypothesis.

Levy (1995) as cited in Nasiru and Usman (2013) argues that positive correlation between savings and investment can arise when fiscal policy is endogenous and also that this correlation is not dependent on capital mobility. To add on, the available literature reviewed reveals that earlier work testing the F-H hypothesis through the regression on cross-section data, including the work that of Feldstein and Horioka (1980), faced the issue of sample selection bias (Nasiru and Usman, 2013). Subsequent studies have used unit root test, Johansen's co-integration test, ARDL Bound Test for co-integration and also Vector Error Correction Model (VECM). The standard co-integration analysis such as Johansen's test, cannot be utilised if savings and investment are of different orders of integration or if the presence of time trend and/ or drift is unknown with certainty. In this case the appropriate method to utilise for estimation is the ARDL Bounds Testing Approach to co-integration analysis which was developed by Pesaran and Pesaran (1997), Pesaran and Shin (1999), and Pesaran *et al*., (2001).

This kind of approach allows the co-integration analysis on variables which are integrated of different orders. Pre-testing of unit root properties is also avoided in this approach which typically has got low explanatory power. Additionally, it can be applied in sample sizes that are smaller and does not push the short-run dynamics into residual terms as in the residual-based co-integration approach. But, ARDL does not tell us the number of co-integrating equations which may lead us to inclusive results. Because of this, alternative test of co-integration such as the Johansen and

Juselius (1990) test could be utilised so as to ascertain the number of co-integrating equations before going on to the VECM estimation. The VECM is utilised so as to accommodate the view of alternative schools to F-H hypothesis, such as, the view of some of the researchers that the low saving-investment correlation is not the only indicator of high international capital mobility (Ekong and Onye, 2015).

On the other hand, Delke (1996) provided results which happened to be consistent with F-H hypothesis for Japanese data. Ozman and Parmaksiz (2003) made use of the Johansen co-integration technique and the Engle and Granger two-step residual-based approach to co-integration to test for the F-H puzzle for the economy of the United Kingdom (UK) for the period 1948-1998. They reached a conclusion that there was a long-run relationship between saving and investment, therefore lending support to the F-H puzzle.

According to Ekong and Onye (2015), generally, there is a bias towards the experience of developed economies when it comes to literature on the test of the F-H hypothesis. Some of these studies supported the F-H view that high correlation of savings and investment rates show that there is low degree of international capital mobility (Penati and Dooley, 1984; Frankel, 1985; Caceres 1985; Dooley, Frankel and Matheison, 1987; Feldstain and Bachetta 1990; Bayoumi, 1990; Bayoumi and Rose, 1993; Taylor, 1996; Caceres, 1997; Khundrakpan and Ranjan, 2010; Nasiru and Usman, 2013).

There has also been a proliferation of studies which have utilized the Autoregressive Distributed Lag (ARDL). These studies include Narayan (2005) for Japan whose empirical results showed that there was a long run relationship between saving and investment. The Granger causality test results suggested evidence of bi-directional causality relationship between saving and investment. As a

result lending support to the F-H (1980) hypothesis. In another study, Singh (2008) examined the long run relationship between saving and investment so as to determine the degree of capital mobility utilizing the two-step Residual-based test, ARDL model and the Granger causality test in India. The results showed long run relationship between saving and investment in India, which supports the F-H hypothesis. The Granger causality test showed unidirectional causality running from saving to investment.

After the 1980s, there were new theories that were being introduced with regards to the relationship between savings and investments, and some of these theories did not lend support to the Feldstein and Horioka(1980) findings. They pointed out the fact that there are many critical factors which influence the relationship between savings and investment including the size of the country, characteristics and structure of the financial sector, endogenous and exogenous shocks, exchange rate regimes and others.

Fouquau *et al* (2008) came up with a theoretical framework when testing the impact of various factors on the relationship between investment and savings. They utilized a panel regression model for 24 OECD countries during the period from 1960 to 2000 and reached a conclusion that the most important factors are the degree of country's openness, the size of the country and the current account balance. In spite of varied estimation techniques employed, these time series studies start from the same premise that saving and investment rates are non-stationary, unit root processes (Grier *et al* 2008). It is important to take into account the sample size and structural beaks that can occur in series when making decisions concerning stationarity of time series, which can lead to the phenomenon of spurious regression and imprecise results.

There are studies which suggest that financial liberalization weakens the link between domestic savings and investment. Of these studies, Chinn and Ito (2007) found that capital outflows may take place in liberalized economies, which in turn lower the availability of funding for domestic investment projects, assuming that savings drive investment demand. Similarly, capital inflows which are found to positively influence capital formation may form an imperfect substitute for domestic savings (Weisskopf, 1970; Corbo and Schmidt-Hebbel, 1991; Webb and Corsetti, 1992; Schmidt-Hebbel, 1994 and Ahmad and Ahmed, 2002). An increase in the deposit rate, as a result of financial liberalization, may increase the marginal propensity to save and as a result reduce aggregate demand (Arestis and Caner, 2004:6). A reduction in aggregate demand leads to a fall in output, thereby decreasing domestic investment as the return to investment would be reduced (Arestis and Caner, 2004:6).

Palley (1996) conducted a test for the causal relationship between savings and investment over the sample period 1973:4-1995:2 utilizing the Granger causality test for the United States (US). The results revealed that investment has got a negative effect on the personal saving and independent of government saving. Personal saving also negatively affected government saving, thereby concurring with the Keynesian paradox of thrift and eventually disputing the F-H puzzle. Utilizing models which take into account structural breaks, Narayan and Narayan (2010) used the Gregory and Hansen Residual-Based structural break test for co-integration for G7 countries from the years 1971-2000. The results showed that there was high capital mobility in these countries since co-integration did not exist between saving and investment. In another study by Ketenci (2012) utilizing the same Gregory and Hansen, and the Johansen approach to co-integration test established that there is co-integration in all cases except for Estonia and Portugal. The low level of the saving-retention coefficient which was estimated in the presence of structural breaks showed

high capital mobility in most of the countries under study, disputing the Feldstein-Horioka (F-H) hypothesis. Brahmasrene and Jiranyakul (2009), and Murthy (2009) reached a conclusion that there is high capital mobility (no F-H hypothesis) in their samples.

Byrne *et al*. (2009) and Constantini and Gutierrez (2013)'s main focus was on the international components behind savings and investment (distinctive and global components in savings and investment). They also rejected the presence of a long-run relationship in the distinctive components of savings and investment. However, they did identify a cointegration relationship between their global factors. On the other hand, Evans *et al*. (2008) alluded that the stability of parameter of the saving-retention coefficient is strongly rejected in the case of Canada, Japan, the United Kingdom, the United States, Argentina, Italy and Sweden and they also found weak evidence which supported the F-H hypothesis. Bai and Zhang (2010) considered the Feldstein-Horioka puzzle within the context of incomplete markets and they argued that the F-H puzzle can be resolved in a model with frictions such as limited enforcement and limited spanning.

Regarding developing economies, a weaker co-integrating relationship between saving and investment has been found than for advanced countries, which therefore implies higher capital mobility. Wahid, Salahuddin and Noman (2008) found that there is a low saving-investment correlation in India, Bangladesh, Sri Lanka, Nepal and Pakistan. On the other hand, Afzal (2007) found no long-run relationship between saving and investment in seven developing countries. However, the author found a long-run saving-investment relationship in South Africa. Cyrille (2010) having studied the long-run relationship between savings and investment for 15 Sub Saharan African countries, found a low co-integrating relationship to be present. De Wet and Eyden (2005) found evidence of high capital mobility for 36 Sub Saharan countries. Frankel, Dooley and Matheison (1986) examined 64 countries, (14 developed and 50 developing countries)

to investigate the relationship between savings-investment rates. They found that except in few less developed countries, there is high correlation between savings and investment, and they shared a long-run equilibrium relationship.

Apergis and Tsoumas (2009) found that there was co-integration between savings and investment rate for 14 European countries, with saving causing investment. This indicated that capital mobility was not high even though there were improved efforts towards economic integration. Similarly, in their investigation of savings-investment relationship for the less industrialized and developing countries, Murphy (1984), Wong (1984), Obstfeld (1986), and Dooley *et al* (1987) found out that there was an association between savings and investment rates. As opposed to the general expectation, their findings showed that the correlations were higher during the periods of economic reform than in the pre-reform era (when the expectation is that capital mobility will be lower while correlation is higher).

The already existing empirical research on the relationship between savings and investment can be further divided into two groups. The first group of research was on non-time series regression analysis. After the work done by Feldstein and Horioka (1980), early empirical studies utilized a simple cross-section regression analysis to study the relationship between savings and investment. This is evident in the work of Feldstein (1983), Murphy (1984), Penate and Dooley (1984), Obstfeld (1986) and Dooley *et al* (1987), which largely supported the Feldstein and Horioka findings that two ratios are highly correlated. This hypothesis is also supported by Haque and Montiela (1991), Tesar (1991), Feldstein and Bacchetta (1991), Sinha and Sinha (1998), Narayan (2005), Ang (2007) and Jiranyakula and Brahmasrene (2008).

The second strand of literature makes use of time-series techniques when studying the relationship between savings and investment. Ozmen (2007) points out a rather significant effect of globalization on the relationship between savings and investment. Each economy is structured with the rest of the world through either financial or political points of view. A strong relationship exists between savings and investment under a fixed exchange regime, while on the other hand, it is weaker under floating exchange regime. Utilizing the same methodology, Jansen, Coakley and Kulas (1997) have shown a positive long-run equilibrium relationship between savings and investment in OECD countries. These studies have shown the potential problem of having spurious regression in time series of savings and investment. Kim (2001), Kim *et al* (2007) alluded that the development of time series analysis has allowed a broader range of regression coefficients for the relationship between savings and investment. In the recent decades, panel regression analysis was mostly utilized when studying the relationship between savings and investment. Krol (1996) was one of the authors that used panel data for 21 OECD Countries. When using empirical testing he got regression coefficients of 0.2 which is definitely less than the estimated regression parameter obtained in earlier studies. Jansen (1996) alluded that the results from Krol's analysis were not what was expected because of the inclusion of Luxembourg in the sample. When Luxembourg was removed from the analysis the ratio increased to 0.6. Coiteux and Olivierar (2000) after making use of panel cointegration techniques found that there was a long-term correlation between savings and investment of 0.6 for 21 OECD countries.

On the basis of time series data, Yamori (1995) conducted a study for Japan by estimating its savings and investment correlations for the period 1970-1985 The empirical results showed that there is no correlation between savings and investment. There have also been arguments that the relationship between savings and investment is uninformative about capital mobility, as a vast

number of factors could influence the relationship. Such factors include: business cycle of which it determines both savings and investment (Obstfeld and Rogoff, 1995); global shocks such as imported inputs and world interest rates that affect both savings and investment simultaneously (Baxter and Crucini, 1993); the response of government to the current account deficit through fiscal policy which makes public saving component align to investment (Summers, 1991).

Amirkhalkhali et al. (2003) examined the savings-investment(S-I) deficit relationship utilizing a random coefficients model for 19 OECD countries over the period 1971 to 1999 and they found out that the S-I correlation is present but the crowding out effect appeared to weaken in the 1990s at the same time that the degree of capital mobility appears to increase. Sinha and Sinha (2004) examine the short and long run relationships between S-I for 123 countries making use of an error correction framework and show that capital mobility was present for only 16 countries, and most of these are developing countries. Hoffmann (2004) utilized a bivariate cointegrated VAR model and found out that the long run capital mobility in UK and US are remarkably stable and high over the mid-19th century up to the early 1990s.

Pelgrin and Schich (2008) utilized the panel error correction techniques to data for 20 OECD countries from the period 1960 to 1999 and they found a long run S-I relationship with a considerable increase in the persistency of the deviations from this long run relation, which suggests that capital mobility has increased. Grier et al. (2008) utilised data from 1947-2007 to study the relationship between S-I in the USA making use of Bai and Perron (1998, 2003) techniques to test for structural breaks. They found a positive relationship in the short run that has weakened considerably over time in terms of magnitude and statistical significance but they did not find any cointegration between S-I in the long run.

Felmingham and Cooray (2006) used the spectral analysis for the sole purpose of analyzing the cyclical and trend behaviour of the S-I relationship for Australia and they found a long run relationship between the two variables. In terms of capital mobility, their results based on an error correction model, revealed that capital mobility is in fact present, and based on their quite recent work (Cooray and Felmingham, 2008) they argue that Australia could adopt policies which focus on increasing investment through increasing domestic savings. However, these results contradict Schimdt's (2003) results who find that investment is actually strongly exogenous and therefore policies which aim to increase investment through domestic savings are actually not likely to be successful for Australia.

Ho (2002) used the FMOLS and DOLS methods in order to estimate panel data for 20 OECD countries for the period 1961 to 1997. These models showed coefficients for the savings rate at levels of 0.84 and 0.47, even though Luxemburg was included. Zubarev (2013) highlights the fact that in the FMOLS models the coefficient was higher, whereas the DOLS models was asymptotically more effective.

In a later work by Ho(2003) the author then tried to test the effect of the size of the country (the country's GDP as a proportion of the total GDP of all the countries considered) on the relationship between the investment and saving rates, when utilising threshold panel regressions. The paper used data on 23 OECD countries for the period 1961-1997. This author took into consideration the specification with two threshold values. The coefficients that were estimated were significant, and the tests performed on the thresholds did not reject the null hypothesis of their significance. Ho (2003) then reached a conclusion that the larger the size of the country then the greater the coefficient of the saving rate. "For countries, the relative size of which was above than an upper threshold, the coefficient was equal to 0.74. For a cluster of the smallest countries it was 0.31. This

result is consistent with the hypothesis that large countries may affect the global interest rate: by increasing its saving a large economy causes a decrease in the world interest rate which results in an increase in investments in its economy"(Zubarev, 2013:6).

Katsimi and Moutos (2007) conducted an investigation as to whether ignoring investment in human capital has a significant effect on the estimate of β. They focused on 25 OECD countries from 1986-2002 and they found out that the value of β ranged from 0.572 for full sample to a low of 0.261 for the period 1997-2002. In a later study by Katsimi and Moutos (2009), they investigated the F-H hypothesis by utilising a broader definition of capital by taking in to consideration saving and investment in human capital. Utilisng data for 25 OECD countries, they find evidence for increasing capital mobility since the 1960s.

For the main reasons of testing breaks in the cointegrated panels, Di Iorio and Fachin (2007) utilised panel bootstrap tests to examine the Feldstein-Horioka puzzle for a panel of 12 EU countries over the period 1960-2002. Their results revealed that the bootstrap panel stability tests allow for cointegration between savings and investment in the long run with at least one break. Their country specific FMOLS estimates of β ranged from 0.59 to 1.03.

Christopoulos (2007) utilized the panel Dynamic Ordinary Least Squares (DOLS) to estimate β with a panel of 13 OECD countries. For the whole period 1885–1992, the estimate of β was equal to 0.48, suggesting that the degree of mobility is relatively high among these countries. However, high capital mobility cannot be accepted for the sub-periods 1921-1992 and 1950-1992 (both are pre-Maastricht periods) where the estimated values of β ranged from 0.79 and 0.90, respectively.

Grier et.al (2008) studied the relationship between savings and investment in the USA making use of the Bai and Perron (1998, 2003) techniques to test for structural breaks. Utilising data from

1947Q1-2007Q1, their results revealed that the saving rate is stationary with two structural breaks in its mean and the investment rate is stationary without a break. By comparing the number of breaks and the pattern of mean shifts, they reached a conclusion that the US saving and investment rates are not linked in the long run. Their VAR-GARCH model revealed a positive relation between the savings and investment rate in the short run. However, this relation has weakened dramatically over time in terms of both magnitude and statistical significance.

Fouquau, Hurlin and Rabaud (2008) took data from 24 OECD countries for the period 1960-2000 and they used panel smooth regression technique on the data. The authors made use of per capita GDP, the current account balance to GDP ratio and other proxies for the country size and the openness of its economy as the threshold variables. The authors showed that high GDP growth rates lead to the increase in the correlation between savings and investment due to the fact that they can lead to an increase in both variables.

However, the openness of the economy leads to a reduction in this correlation: it becomes easier for such economies to borrow in the international market. The larger the country, the higher is the correlation between savings and investment. One more important result derived from this work was confirming the fact that the correlation between saving and investment decreases over time.

Other authors such as Giannone and Lenza (2004) also reached a similar conclusion that the coefficients of the saving and investment rates decreased over time. Their results do not actually reject the existence of the Feldstein-Horioka puzzle, but they speak in favour of an increase in the mobility of global capital from the 1970s up to the present day.

Other works have also looked at the dependence of the relationship between savings and investment on country size and the period that is being analysed. For example, Coakley, Fuertes

and Spagnolo (2004) found that there was high capital mobility during the period 1980-2000 when making use of data on 12 OECD countries.

Helliwell (2004) and Feldstein (2005) showed in their studies that he correlation between saving and investment rates from the mid-1990s was decreasing for all the small OECD economies, but remained significant for the large OECD countries. The explanation for this was the possibility of segmentation of the global capital market which, in turn, could result from the ability of larger economies to influence the world interest rate through their savings volumes.

Different authors studied the issue of capital mobility in terms of the relationship between savings and investment in less developed countries. For instance, Kasuga (2004) looked at a sample of less developed countries. The author reached a conclusion that the correlation between saving and investment was higher in developed countries as compared to developing countries. This high correlation can also be seen in countries where the primary securities markets are more developed than the banking sector. A possible explanation for this can be the fact that the better developed primary financial market transforms a change in savings into a change in wealth more effectively than does the banking sector. “Hence, the higher correlation between saving and investment in developed countries may be explained by the relatively high degree of development of their financial markets” (Zubarev, 2013:7).

Blanchard and Giavazzi (2002) studied current account balances, savings and investment and found that the F-H puzzle had disappeared in the euro zone. On the other hand, Telatar et al. (2007) studied nine European Union (EU) countries for the period 1970-2002 and they found that six of these countries transitioned from a low to a high capital mobility regime with Economic and Monetary Union (EMU).

Fountas and Tsoukis (2000) empirically investigated the interactions among the current account, budget balances and the real interest rate because it can provide more information about the effective degree of financial openness than simple saving-investment correlations which are being mostly used by other studies. Their findings were that in short run there is some evidence in favour of the twin deficits and current account targeting hypotheses. On the other hand, Fidrmuc (2003) investigated the evidence of twin deficits and the F–H puzzle for such economies and found a positive long-run relationship between the twin deficits in several countries. Investment in some EU countries is financed to a greater extent via the international financial markets involving that the F–H puzzle is less significant in the EU countries.

Kumar and Bhaskara Rao (2011) in a sample of 13 OECD countries, Jayasekera and Kling (2014) in a sample of 252 countries, found a negative EMU effect on the saving retention coefficient. Schmitz and von Hagen (2011) find that the current account imbalances significantly widened in the euro area since the onset of EMU while the current account balance of the euro zone as a whole remained almost balanced. One of their findings were that capital flows follow differences in capital endowments. All of these authors explain their results as showing financial market integration deepening in the euro area and they also claim that the observed current account imbalances indicated that the euro area was properly functioning. However, these studies do not take into account the differences between groups of countries within and outside the single market nor do they include the time of the recent financial crisis.

In another study, Choudhry et al. (2014) found out that there was an increase in capital mobility until the beginning of the financial crisis and then it declined thereafter. Johnson and Lamdin (2014) in their study also found out that there was a positive impact of the financial crisis on the coefficient of the saving-ratio for the euro zone and non-euro countries of the EU. More

specifically, they estimated the F-H equation for 40 OECD countries for the period 1980-2012 and they found out that there was an increase in β (0.06) during the period 2006-2012 for the EU and euro zone countries whereas for the rest of the countries the savings ratio coefficient was not affected. However, somewhat surprisingly, they found that this effect was present from 2006-2008 and disappeared in the subsequent years.

For 14 Latin American countries and four Caribbean countries, Murthy (2005) utilised cointegration techniques to analyse the Feldstein-Horioka hypothesis for the period 1960-2002. The results showed a low correlation between savings and investment, which then revealed that the F-H hypothesis does not exist in practice.

In their study Caporale *et al*. (2003) used a series of different and efficient cointegration estimators. Their conclusion was that even though there was evidence which supported the F-H result, there appears to be considerable heterogeneity in terms of the savings-investment association. Levy (2004) found that long-run investment-saving correlation follows directly and is not dependent on the degree of international capital mobility. Khedhiri and Hebiri (2005) found that there was a significant correlation between savings and investment, and therefore there was no solution to solve the F-H puzzle, regardless the implications of international capital mobility in six countries such as Algeria, Egypt, Morocco, Saudi Arabia, Syria and Tunisia. Rao et al. (2008) found the F-H puzzle is present in a weaker form with a reduced saving retention coefficient the F-H equation for 12 OECD countries.

Tsoukis and Alyousha (2002) did a Granger's causality analysis between gross savings and gross investments in seven highly advanced economies (Australia, Canada, Germany, Japan, the Netherlands, Great Britain and the US), starting from the year 1945. The results of their study only

showed a cointegration between savings and investments in Australia and Great Britain, and showed that savings were a cause for investment in Granger's sense in both countries.

Onafowara, Owoye, Huart (2011) estimated the relationship between savings and investment in 8 highly economically developed EU countries. They utilized the ARDL, a vector error correction model (ECM) and a vector autoregressive model (VAR). Their findings were that there was evidence of cointegration between savings and investment in six of those countries. Also, the findings revealed that savings are a significant determinant for investment in the Netherlands and Great Britain, a reverse causality in Denmark, Germany and Luxembourg, a bidirectional causality in Belgium, and there was no relationship between savings and investments in France and Italy.

For Turkey, Yıldırım (2000) used the ARDL approach for the period 1962-1968. Due to the effects of financial innovations and other developments, the author added a trend variable to the model and with the examination of remains after the initial regression, she added a dummy variable to the model for this period because of a value which deviated between the periods of 1976-1983. In conclusion, the short term saving-retention coefficient is actually low in Turkey and this finding shows that capital mobility is present. Besides, the author interpreted in the way that any kind of imbalance can be adjusted by the high error correction term.

Adedeji and Thornton (2008) used the panel cointegration technique for the period 1970-2000 for the 50 developed and developing countries, one of which was Turkey. Their findings were that: (i) savings and investment series are non-stationary cointegrated data, (ii) there are differences in the saving- retention coefficients of the country groups. There is a lower savings-retention coefficient in OECD and African countries, (iii) in all country groups the saving-retention coefficients have fallen down significantly in the second half of the period. The findings obtained by the authors

mentioned are consistent with the hypothesis stating that international capital flows increase with time.

Yenturk *et al* (2007) used quarterly data for the period of 1987-2003 taking into account private savings and investments. In the study, it was observed that there were mutual relationships between growth, savings and investments. There was also cointegration between the mid and long term savings and investments, but there was no relation present in the short term. The study also looked at the causality relationship between the variables in question and the finding was revealing that growth was a result of both the savings and investments.

Papapetrou (2006) utilised OLS, rolling OLS, Kalman filter and Markov switching regime modelling technique to capture major policy regime changes for the period 1980-2003, found that there was a decline over time in the estimated time varying coefficients which shows that due to financial liberalization the capital mobility increased. Hatemi-J and Hacker (2007) made use of the Kalman filter when analyzing capital mobility in Sweden between the period 1993 and 2004. Their findings were that the correlation is comparatively low and has decreased before 1995 when Sweden joined the EU. Surprisingly they saw that even after joining the EU, capital mobility still has not increased.

Even though there were a lot of empirical studies on OECD countries, little has been done in terms of empirical attempts to verify if whether there was a presence of capital mobility utilising the F-H approach for African countries. Some of the limited studies which have tried to address this are the work by Payne and Kumazawa (2005) and De Wet and Van Eyden (2005) who have used fixed and random effects to study the relationship between savings and investment in sub-Saharan

African countries during the period 1980-2000. The evidence from the studies suggests that there is capital mobility in Africa.

Another study by Adedeji and Thornton (2006) looked at testing the F-H approach utilising the panel cointegration techniques to data for six African countries. The main finding in their paper was the fact that capital was relatively mobile in the African countries during the period 1970-2000, with estimated savings retention ratios of 0.73 (FMOLS), 0.45 (DOLS), 0.51 (DOLS with heterogeneity), and 0.39 (DOLS with cross-sectional dependence effects). However, the study by Adedeji and Thornton (2006) does not take into consideration the various groups of countries in Africa and panel cointegration tests utilizing the Pooled Mean Group (PMG) estimator.

In the case of South Africa, the available studies on this subject include Chipote and Tsegaye (2014) who examined the determinants of household savings in South Africa for the period 1990-2011. Chauke (2011) looked at the determinants of household savings of the black middle class in South Africa with reference to questionnaires and quantitative answers from the respondents in four of South Africa's provinces. On the other hand, Du Plessis (2008) also investigated the determinants of household saving behavior in South Africa doing one-on-one interviews with selected economists.

3.3 Analysis of literature review

The review of literature has highlighted the different models which link capital flows to savings and hence investment. At the same time the empirical literature has indicated conflicting results. In the case of South Africa it is interesting to note that the majority of the available studies have largely focused on examining the determinants of savings (Chauke, 2011 and Chipote and Tsegaye, 2014) or focusing on savings or examining the link between savings and investment, not

necessarily looking at the application of the F-H hypothesis(Cooray and Sinha 2007, and Afzal, 2007).

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This section of the study will deal with the specification of the model which the theoretical framework in the preceding chapter has laid some foundation. This chapter will basically build on the literature review that is already available. The main purpose of this section is to establish a model which will be a basis for empirical analysis of the research problem from the perspective of South Africa. The chapter is basically divided into two sections. The first section focuses on model specification, whereas the second section will dwell on the estimation techniques which will be used in the study.

4.2 MODEL SPECIFICATION

In examining the link between investment, savings and capital flows, the study utilized the F-H hypothesis discussed in the literature review section. The model is specified as follows:

$$\frac{I}{Y_t} = \beta_0 + \beta_1 \frac{S}{Y_t} + \varepsilon_t \qquad (4.1)$$

Where, I/Y and S/Y represent the period averages of investment and savings to GDP ratios, respectively, β_1 is the degree of the relationship between investment and savings, and ε_t is the disturbance term.

Given that there is a short-fall between savings and investment in South Africa, and the reliance on foreign capital, the model was augmented with additional variables. Thus the empirical model used in the study is presented as follows:

$$\frac{I}{Y_t} = \beta_0 + \beta_1 \frac{S}{Y_t} + \beta_2 FC_t + \beta_3 R_t + \beta_4 Infl_t + \beta_5 Fin_t + \varepsilon_t \qquad (4.2)$$

Where, in addition to variables defined in equation 1, *FC* represents foreign capital, *R* is interest rate, *Infl* is inflation and *Fin* represents financial development.

In examining equation 2 the study utilized two samples. The first sub-sample was from 1960 to 1994. During this period the country experienced a fixed exchange rate regime to the British sterling and was characterized by a lot of capital controls such as the Currency and Exchange Act. The second period includes the post-reform era, the period from 1995 when the capital account was liberalized and the exchange rate became more flexible. For the second sub-period, the savings function was interacted with the financial reform Index of Abiad *et al.* (2010) which is based on seven dimensions of financial liberalization, ranging between 0 and 21. This was meant to examine the link between investment and savings in South Africa in the second period where there had been more initiatives to liberalize the financial sector attracting more foreign capital. Given that the F-H hypothesis postulates that the correlation between investment and savings is high in the era where capital mobility is low, in the first sub-period was expected that the relationship between savings and investment would be more pronounced as compared to the second sub-period.

4.3 DEFINITION OF VARIABLES AND APRIORI EXPECTATIONS

In equation (1) above, β_1 has the most vital role and is referred to as the Feldstein-Horioka coefficient or rather the link between domestic savings and investment. This is consistent with Petreska and Mojsoska-Blazevski (2013). The value of β is between 0 and 1. When $\beta=1$ it means that there is 100% correlation between domestic savings and domestic investment. This means that there is no foreign investment into the country, therefore capital mobility is zero. Another situation is when $\beta=0$, where the overall domestic investment is financed with foreign capital, which shows perfect capital mobility.

The FC is foreign capital which is measured by foreign direct investment (FDI) and overseas development assistance (ODA). The FER represents foreign external finance. It was measured by foreign direct investment, AIDaid, remittances and cross-border banking. There is no consensus regarding the impact of foreign external financial flows on savings and investment. There are studies such as Rao and Kumar (2007) and Bashier *et al.* (2007) which argue that external financial flows augment domestic savings and hence result in more investment. On the other hand, Ahmad and Ahmed (2002) and Waheed (2004) argue that foreign finance has a negative impact on savings which also translate to investment. Thus the impact of external finance investment will remain an empirical question.

Inflation is measured by the consumer price index (CPI). A negative relationship between inflation and investment is expected. Inflation is an indication of macroeconomic instability that reduces the level of investor confidence. According to Fischer (2005), inflation is harmful to economic growth. Furthermore, De Gregorio (1993) alluded that higher inflation has the effect of decreasing labour supply and therefore reduces economic growth.

The R is the rate of interest rate which is measured by the repo rate. An increase in the interest rate represents an increase in costs of borrowing. Thus a negative relationship will be expected between investment and interest rate. D'Adda and Scorcu (2001) conducted studies on the relationship between economic growth and the actual interest rate during the period of 1994-1960 utilising panel database. The results showed that there is negative correlation between growth and actual interest rate and the decrease of economic growth in the recent decade's results from execution of limiting monetary policies.

4.4 ESTIMATION TECHNIQUES

Spurious regressions are known to be misleading because of being unable to reflect true relationships between variables. Before any empirical estimations are done, we have to first do pre-unit root tests so as to get a better understanding of the underlying data generating process for application of suitable methodology. Various pre-testing methods are discussed below.

4.4.1 UNIT ROOT ANALYSIS

The first step to undertake in our analysis is the testing of stationarity of our variables. This test is undertaken to examine the time series properties of the individual variables. Stationarity means that the distribution of time series variable does not change over time. In other word, stationarity wants the future to be like the past, at least in a probabilistic sense. However, in the real word many economic time series are not stationary and therefore cause the standard OLS-based statistical inferences to be misleading. The reason behind conducting these stationarity tests, therefore, is to determine the order of integration of each of the variables that we focus on in this study and thus the number of times that a particular variable must be differentiated to achieve stationarity. We are also doing this so as to avoid the possibility of a spurious regression. Gujarati (2003) suggests that a stationary stochastic process implies that the mean and variance are constant over time, and the covariance between two periods depends only on the lag between the two time periods and not the actual time at which the covariance is computed. This implies, therefore, that a non-stationary time series will have a varying mean or variance or both.

There are different methods which are utilised to test for Stationarity and unit roots, including informal and formal tests. The informal tests are done by means of visual plots of data in the form of graphs and correlogram (autocorrelation function). The formal unit root tests include the Augumented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. In this study we made use

of both informal and formal tests to establish stationarity/unit roots in our variables. Informal tests are quite simple and they check for stationarity by plotting the time series and looking for evidence of a trend in mean, variance, autocorrelation and seasonality. They utilise subjective visual inspection of plots and correlograms. However, they do give hints if whether stationarity exist or does not exist. Formal tests assist with determining stationarity and are based, for the most part, on formal statistical tests. The difference between the different types of formal tests is dependent on the stringency of the assumptions they use as well as in the form of the null and alternative hypotheses they adopt. Most economists adapt to formal tests because of their statistical nature. The time series properties of the variables was analysed carefully through the Augmented Dickey Fuller (ADF) and the Phillips Peron (PP) tests. The two methods were used so as to get robust results (Ntshangase, 2014).

4.4.2 AUGMENTED DICKEY FULLER (ADF)

The Dickey-Fuller test is implemented so as to show whether the series contains a unit root or not. The null hypothesis is that there is a unit root and thus, the series is non-stationary. There are a series of steps that one has to follow when carrying out this test. The method of ordinary least squares (OLS) is used to find the coefficients of the model then the t-statistic is computed and compared with the relevant critical values to estimate the significance of the co-efficient. If the test statistic is less than the critical value then the null hypothesis is rejected with the conviction that there is no unit root (Brooks, 2008:328). There is a difference between the Dickey-Fuller (DF) test and the Augmented Dickey-Fuller (ADF) test in the sense that the DF test is conducted under the assumption that the error term, μ_t, is uncorrelated whereas the ADF test is used in the event that the error terms are correlated (Gujarati, 2004:827). Augmenting simply refers to adding lagged variables of the dependent variable.

The DF method has been criticised for the near observation equivalence. This takes place when the statistical power of the analytical tests is low because they often cannot distinguish between true unit-root processes and near unit-root processes. In addition to the criticism, the DF test is valid only if μt is assumed not to be autocorrelated, but would be so if there is autocorrelation in the dependent variable of the regression ΔYt. The test would therefore be outsized. This means that the true size of the test would be bigger than the normal size utilized. The error term should, therefore, satisfy the assumption which is made with regards to normality, constant error variance and independent error term failure would render the DF tests biased (Takaendesa, 2006 as cited in Ntshangase, 2014). These problems can be removed by using a stricter version of DF test method which is known as the ADF test together with the Phillips-Peron (PP) test. The ADF test is the most utilised as compared to the DF test since the latter has critical values that are bigger in absolute terms and may sometimes lead to a rejection of a correct null hypothesis (Brooks, 2004:379).

An ADF is a test that is utilised to test for a unit root in a time series sample. It is an augmented version of the Dickey–Fuller test used 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 higher the rejection of the hypothesis that there is a unit root at some level of confidence. The ADF test is one of the widely utilised tests for unit root in time series models. It involves the utilisation of the ordinary least-squares (OLS) method to find the coefficients of the chosen model. The t-statistic is computed and compared with the relevant critical value to estimate the significance of the co-efficient. If the test statistic is less than the critical value, then we reject the null hypothesis with the conviction that there is no unit root (Brooks, 2002).

The respective time series will first be tested using the improved ADF test because it gives us better results than the DF test as it includes extra lagged terms of the dependent variable in order to eliminate autocorrelation. The ADF test for unit root involves the estimation of the following equation:

$$\Delta y_t = \alpha_0 + \gamma y_{t-1} + \alpha_2 t + \sum_{i=1}^{p} \beta_i \Delta y^{t-1} + \mu_t \qquad (4.3)$$

The equation shows us that $\Delta Y_t = Y_t - Y_{t-1}$; $\Delta Y_{t-1} = Y_{t-1} - Y_{t-2}$ and the number of lags to be included is empirically determined using Schwarz information criteria (SIC). The same critical values for the DF are calculated by Monte Carlo simulation in MacKinnon-Haug-Michelis (1999) as the distribution is not standard. The test then continues by testing the significance of the co-efficient of Y_{t-1}. The augmenting is done to remove possible autocorrelation among the null error and say that the variable is stationary.

4.4.3 THE PHILLIPS PERON (PP) TEST

Phillips-Peron tests are in essence, similar and more often than not, yield similar results to ADF tests mentioned above. The main distinguishing characteristic of these tests according to Brooks (2008:330) is that PP tests include an automatic correction to the DF procedure to allow for auto correlated residuals. According to Gujarati (2004:818), the ADF takes care of possible serial correlation in the error terms, but the PP tests are unique in the sense that they use nonparametric statistical methods to take care of the serial correlation without adding lagged difference terms. It rather takes the same estimation scheme as in the DF test, but corrects the statistic to conduct for autocorrelations and heteroscedasticity (Heteroscedasticity and autocorrelation consistent [HAC] type corrections). Another disadvantage of the PP test is that it is based on asymptotic theory. The

similarity of these tests also extends to the fact that these tests also suffer from the same fundamental limitations.

The PP test is utilised in time series analysis to test the null hypothesis that a time series is integrated of order 1. Like the ADF test, the PP test addresses the issue that the process of generating data for y_t might have a higher order of autocorrelation than is admitted in the test equation, making y_{t-1} endogenous and therefore making the Dickey-Fuller t-test to be invalid. These tests often give the same conclusions, and suffer from most of the same important limitations as the ADF tests.

This test allows for fairly mild assumptions concerning the distribution of errors. The test regression for the Phillips-Perron test is the AR (1) process given as:

$$\Delta y_{t-1} = \alpha_0 + \gamma y_{t-1} + \varepsilon_t \qquad (4.4)$$

As there is a likely event that there will be a serial correlation in our explanatory variables (investment, saving, foreign capital, interest rate, inflation, and financial development), the PP test corrects for higher order serial correlation by adding lagged differenced terms on the right-hand side. This test corrects the t-statistic of the coefficient γ from the AR (1) regression so as to account for the serial correlation in e_t. In addition, the PP test has an advantage over the ADF test when the concerned time series has serial correlation and there is a structural break. All of our variables will be tested for stationarity using the above methods.

4.4.4 COINTEGRATION ANALYSIS

Just before the year 2000, there were two major approaches which drove the Cointegration analysis, either the two-step residual based procedure for testing the null of cointegration (Engle and Granger (1987) and Phillips and Ouliaris (1990)) or the systems-based approached that was developed by Johansen (1991,1995). Other approaches such as the variable addition approach of Park (1990), the residual-based procedure by Shin (1994) and the stochastic common trends (system) approach of Stock and Watson (1988) as cited in Mutsau (2013) have been utilised, but less extensively. According to Pesaran *et al*. (2001), these approaches have aggravated the degree of uncertainty into the analysis of level relationships because of the need for pre-testing. Feridun (2010) alludes that cases where the presence of structural breaks introduces uncertainty as to the true order of integration of the variables, the bounds testing procedure introduced by Pesaran (1997), Pesaran and Shin (1999) and Pesaran *et.al* (2001) should be the used. This is the reason why we used the ARDL modelling approach to Cointegration in our study. There are some advantages of the ARDL technique as compared to other methods of co-integration. Pesaran and Pesaran (1997) argued that the ARDL technique is more flexible. It can also be utilized irrespective of whether the variables are of different order of integration. On the other hand, Johansen requires that variables must be of the same order of integration, for example I (1). The ARDL technique is also more efficient and reliable in small samples unlike those from the Johansen technique (Inder, 1993). The ARDL specification allows separate identification of both long-run and short-run coefficients of explanatory variables (Tang, 2007). According to Cook (2006), the F-test (ARDL) possesses greater power than both the Engle-Granger and the GLS-based cointegration tests.

The bounds testing approach to cointegration was developed by Pesaran *et al*. (2001) for the purposes of testing the existence of a level relationship between endogenous variable and its explanatory variables when it is known that regressors are trend or difference stationary. Which is

why this approach is applicable whether the underlying regressors are I (1), purely I (0, fractionally integrated or mutually cointegrated). “The statistic underlying the bounds testing procedure is the familiar Wald or F-statistic in a generalised Dickey-Fuller type of regression used to test the significance of lagged levels of the variables under consideration in a conditional unrestricted equilibrium correction model (ECM). It is given in this procedure that the asymptotic distributions of both statistics are non-standard under the null hypothesis that there exists no relationship in levels between the included variables, irrespective of whether the regressors are I (1), purely I (0) or mutually cointegrated. They established that the proposed test is consistent and drives its asymptotic distribution under the null and suitably defined local alternatives, for a set of regressors which are a mixture of I (0) and I (1) variables” (Pesaran *et al.*, 2001:1 as cited in Mutsau, 2013).

As shown by Pesaran and Shin (1999), the small sample properties of the bounds testing approach are superlative as compared to the traditional Johansen cointegration approach, which basically wants a large sample size for the results to be considered valid. According to Feridun (2010), the ARDL (Bounds testing approach) has a likelihood of having better statistical properties than the traditional cointegration techniques due to its ability to draw on the unrestricted error correction model. In particular, Pesaran and Shin (1999) show that the ARDL approach has got much better properties in small sample sizes up to 150 observations. However, Narayan and Narayan (2005) have provided the same critical values for up to 80 observations. The bounds testing approach is a more superlative test for cointegration analysis if structural breaks are present in the time series data (Feridun, 2010:18).

4.4.5 ERROR CORRECTION MODEL (ECM)

So far the only criticism of the cointegration regression that has been examined is the fact that only the long run properties of a model are taken into consideration and not the short-run dynamics.

"These long-run relationships measure any relation between the level of the variables under consideration while short run dynamics give a measure of the dynamic adjustments between the first-differences of the variables" (Mutsau, 2013:106). A main characteristic of variables which are cointegrated is that their time paths are influenced by the degree of any deviation from long-run equilibrium. If the system does return to long-run equilibrium, then the movements of some of the variables have to respond to the magnitude of the disequilibrium (Enders, 2010:365 as cited in Mutsau, 2013). In order for a time series model to be considered good, it has to account for both the short-run dynamics and long-run equilibrium at the same time. This is where the error correction model becomes useful in order to close this gap in cointegration analysis.

The error correction model (ECM) has been widely utilised in time series econometrics. Looking at a rather simple model that has an endogenous variable *y* and also a single explanatory variable *x*, then the error correction term can be recognised as $\varepsilon_t = y_t - \beta x_t$, where β is known as the cointegrating coefficient. The ε_t is then the error term from cointegrating y_t on x_t. Therefore, an ECM can be defined from the above bivariate relationship as:

$$\Delta y_t = \alpha \varepsilon_{t-1} + \Phi \Delta x_t + \mu_t \qquad (4.5)$$

where μ_t is identically and independently distributed with a mean of zero and infinite variance (Mutsau, 2013).

The ECM equation:

$$\Delta y_t = \alpha \varepsilon_{t-1} + \Phi \Delta x_t + \mu_t \qquad (4.6)$$

states that the lagged ε_{t-1} and Δx_t can explain Δy_t. It also says that ε_{t-1}, the lagged error term is a one that is in equilibrium or disequilibrium and that would have taken place in the previous period.

If the error term was equal to zero then assumption would be that the model is in equilibrium and the opposite is true. Assuming that Δx_t=0 and that ε_{t-1} >0, indicating that Δy_{t-1} is above its equilibrium value. Therefore, in order to return to equilibrium then Δy_t has got to be negative. "The intuitive implication is that the error correction coefficient α must be negative such that:

$$\Delta y_t = \alpha \varepsilon_{t-1} + \Phi \Delta x_t + \mu_t \quad (4.7)$$

has dynamic stability. Alternatively, disequilibrium due to the excess of Δy_{t-1} above its equilibrium, forces y_{t-1} to fall in the successive periods and the equilibrium error will be corrected in the model, hence the term error correction model" (Mutsau, 2013:107).

"Notably, β is called the long-run parameter, while α and ϕ are short-run parameters. Therefore, the ECM has in built long-run and short-run properties. The long-run property is embedded in the error correction term ε_{t-1} and the short run behaviour is partially captured by the error correction coefficient, α. Of utmost significance is that all the variables in the ECM are stationary and that makes it free from the spurious regression problem. Generally, the error correction term is unknown apriori and it should be estimated through the Engle Granger two-step procedure. Firstly, one has to run a regression of *y* on *x* and save the residuals:

$$\hat{\varepsilon}_t = y_t - \hat{\beta} x_t \quad (4.8)$$

before running an ECM regression of Δy on $\hat{\varepsilon}_t$ Δx through equation:

$$\Delta y_t = \hat{\alpha} \varepsilon_{t-1} + \Phi \Delta x_t + \mu_t" \quad (4.9)$$

According to Cottrell (2004) the ECM can be mathematically derived firstly with a bivariate relationship where $Y_t = KX_t$. We can then re-write this equation in logarithmic form as $y_t = k + x_t$

which follows the convention of letting a lower-case letter indicate the natural log of the variable shown by the corresponding upper case letter. By taking logs, this reduces the burdensome multiplicative relationship to an additive one, which is a vital mathematical simplification. Therefore a dynamic relationship between y and x can be expressed as:

$$y_t = \beta_0 + \beta_1 x_t + \beta_2 x_{t-1} + \alpha_1 y_{t-1} + \mu_t \quad (4.10)$$

According to Mutsau (2013) by including the lagged values of both *x* and *y* in the above expression, the realization of a wide variety of patterns which are dynamic in the data is enabled. In order to evaluate the extent to which the conditions under which the generic dynamic equation are consistent with the long-run equilibrium relationship, the factors that could cause divergence should then be 'zeroed out'. To be more specific, factors such as changes in x_t and stochastic fluctuations, μ_t lead to divergence from equilibrium. It is then important to set $y_t = y^*$ and $x_t = x^*$ for all *t*, and set $\mu_t = 0$. By doing so, we get:

$$y^* = \beta_0 + \beta_1 x^* + \beta_2 x^* + \alpha_1 y^* \quad (4.11)$$

$$\Rightarrow (1-\alpha) y^* = \beta_0 + (\beta_1 + \beta_2) x^* \quad (4.12)$$

$$\Rightarrow y^* = \frac{\beta_0}{1-\alpha_1} + \frac{\beta_1 + \beta_2}{1-\alpha_1} x^* \quad (4.13)$$

If the above corresponds to the equation, $y_t = k + x_t$ then it should follow that $k = \frac{\beta_0}{1-\alpha_1}$ and $\frac{\beta_1 + \beta_2}{1-\alpha_1} = 1$. The second implication in this is that $\beta_1 + \beta_2 = 1 - \alpha_1$. Let π show the common value of these two terms. Then β_2 can be shown as $\pi - \beta_1$ and α_1 can be shown as 1-π. Therefore, equation

$$y_t = \beta_0 + \beta_1 x_t + \beta_2 x_{t-1} + \alpha_1 y_{t-1} + \mu_t$$

$$y_t = \beta_0 + \beta_1 x_t + (\pi + \beta_1) x_{t-1} + (1-\pi) y_{t-1} + \mu_t \quad (4.14)$$

$$\Rightarrow y_t = \beta_0 + \beta_1 x_t - \beta_1 x_{t-1} + \pi x_{t-1} - \pi_1 y_{t-1} + y_{t-1} + \mu_t \quad (4.15)$$

$$\Rightarrow y_t - y_{t-1} = \beta_0 + \beta_1 (x_t - x_{t-1}) + \pi (x_{t-1} - y_{t-1}) + \mu_t \quad (4.16)$$

Due to this, $\Delta y_t = \beta_0 + \beta_1 \Delta x_t + \pi (x_{t-1} - y_{t-1}) + \mu_t$ where $\Delta x_t \equiv x_t - x_{t-1}$ is a triple equality condition. Therefore, this is the characteristic "error correction" specification, where the change in one variable is related to the change in another variable, as well as the gap between the variables in the previous period.

4.4.6 ARDL APPROACH TO COINTEGRATION

An ARDL relationship is present in a regression equation, where regressors are include lagged values of the dependent variable and current and lagged values of one or more explanatory variables. In an analysis using time series the explanatory variable may have an effect on the dependent variable which has a time lag and this often necessitates the inclusion of lags of the explanatory variable in the regression. The dependent variable maybe correlated with lags of itself, suggesting that lags of the dependent variable should be present in the regression as well (Mutsau, 2013). The theoretical properties of the ARDL technique can be analysed through an equation.

$$y_t = m + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t \quad (4.17)$$

This is referred to as an ARDL (1, 1) due to the fact that the dependent variable and the single explanatory variable are each logged once. The residual error term, εt, is assumed to satisfy all the classical assumptions of the OLS, hence a white noise process. The inversion of the lag polynomial in y gives:

$$y_t = (1 + \alpha_1 + \alpha_1^2 + \ldots) m + (1 + \alpha_1 L + \alpha_1^2 L^2 + \ldots)(\beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t) \quad (4.18)$$

Therefore the current value of *y* is dependent on the current and all previous values of *x* and ε_t.

Alternatively, this relationship reveals that the current value of *x* has got an effect on the current and future values of *y* (Johnston and DiNardo, 1997:244). The partial derivatives which are taken from equation $y_t = m + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t$ can be expressed as:

$$\frac{\partial y_t}{\partial x_t} = \beta_0 \qquad (4.19)$$

$$\frac{\partial y_{t+1}}{\partial x_t} = \beta_1 + \alpha_1 \beta_0 \qquad (4.20)$$

$$\frac{\partial y_{t+1}}{\partial x_t} = \alpha_1 \beta_1 + \alpha_1^2 \beta_0 \qquad (4.21)$$

By including the lags means the likelihood of a set of dynamic responses in *y* to any given change in *x.* An immediate response is present, which is followed by short-run, medium run and long-run responses. The long-run effect of a unit change in x_t is obtained when we sum up the partial derivatives; if the stability condition is satisfied, the sum is $\frac{(\beta_0 + \beta_1)}{(1-\alpha_1)}$. If *x* is kept at a constant at some level $\bar{x}$ indefinitely, then *y* will tend to be a constant value and $\bar{y}$ which is shown by $\bar{y} = \frac{m}{1-\alpha_1} + \frac{\beta_0 + \beta_1}{1-\alpha_1}\bar{x}$, if the stability condition and innovations are set at their expected value of zero. This is known as a static equilibrium equation. If the natural logarithms of *y* and *x* are **Y** and **X**, equation $\bar{y}\frac{m}{1-\alpha_2} + \frac{\beta_0 + \beta_1}{1-\alpha_1}\bar{x}$ shows an elasticity equilibrium relation which is constant: $Y = AX^{\gamma}$ or in the log form $y = a + \gamma x$ where $a = \frac{m}{1-\alpha_1}$ and $\gamma = \frac{\beta_0 + \beta_1}{1-\alpha_1}$.

In instances whereby the variables of interest are trend stationary, what has been generally done was to de-trend the series and to model the de-trended series as stationary distributed lags or ARDL models. The estimations and inferences which then concern the properties of the model are carried out utilizing standard asymptotic normal theory. However, the analysis becomes much more difficult if the variables are difference stationary, or l (i). "Literature on cointegration is concerned with the analysis of the long run relations between I (1) variables, and its basic premise is at least implicit in that, in the presence of I (1) variables the traditional ARDL approach will no longer be applicable. Consequently, a large number of alternative estimation and hypothesis testing procedures have been specifically developed for the analysis of I (1) variables (Phillips and Hansen, 1990 and Phillips and Loretan, 1990)" (Mutsau, 2013:111).

4.5 GRANGER CAUSALITY TESTS

In addition to checking the long-term relationship between savings and investment, Granger causality tests was also performed. This test helps to determine whether savings precedes investment or vice versa. The Granger causality tests performed were of the following form:

$$LINVY_t = \phi_0 + \sum_{j=1}^{p} \phi_j LSAVY_{t-1} + \phi_2 \sum_{j=1}^{p} \phi_j LINVY_{t-1} + \varepsilon_t \quad (4.22)$$

$$LSAVY_t = \psi_0 + \psi_1 \sum_{j=1}^{p} \psi_j LINVY_{t-1} + \psi_2 \sum_{j=1}^{p} \psi_j LSAVY_{t-1} + \varepsilon_t \quad (4.23)$$

Where *LINVY* represented the natural log of ratio of gross national investment to real GDP and *LSAVY* is the natural log of ratio of total national savings to real GDP (Ekong and Onye, 2015).

4.6 DATA COLLECTION AND SOURCES

The Data for the variables to be utilized in the study was obtained from the South African Reserve Bank online query. The study utilized two samples; the first sub-sample was from 1960 to 1994. The second period included the post-reform era, the period from 1995.

4.7 CONCLUSION

The purpose of this chapter was to highlight the methods that were utilised in pursuing the objectives of the research. The various research techniques that were used were discussed. These include tests for stationarity and cointegration. The chosen methods used to test for stationarity were the Dickey Fuller and Augmented Dickey Fuller tests. Cointegration tests were conducted using the bounds testing approach (ARDL approach). When co-integration was established, an Error Correction Model (ECM) was specified. This was mainly because in the short-run, variables may be in disequilibrium and are associated with the disturbances being the equilibrating error. The short-run disequilibrium dynamic link between the variables were enlightened by the ECM. The next chapter goes further and presents the results from the data obtained.

CHAPTER 5

EMPIRICAL ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

The main aim of this chapter is to provide the results of the models which were estimated in Chapter 4. The chapter is made up of nine subsections. Following the introduction, section 5.2 presents descriptive statistics. Section 5.3 presents the correlation matrix while Section 5.4 shows the analysis of the time series properties of the data through unit root tests. Section 5.5 presents the ARDL Bounds test results, Section 5.6 discusses the long-run cointegration results while Sections 5.7 and 5.8 discusses the Error Correction Model and the diagnostic tests. The conclusion of the chapter is provided in Section 5.9.

5.2 DESCRIPTIVE STATISTICS

Table 5.1 below reports the summary statistics for all the variables used in the current study. The mean value of the investment (GFCF) variable is 13, with a standard deviation of 0.3. All the variables employed in the model are normally distributed as shown by the p-value of the Jarque-Bera test.

Table 5. 1: Summary of Statistics

	GFCF	SAVINGS	LFDI	ODA	PIM	REPO_RATE
Mean	13.02548	16.47647	21.80210	13.48624	1.43109	4.695279
Median	13.17310	16.60000	22.14379	12.28180	1.17509	4.472620
Maximum	13.36654	18.90000	23.01428	22.49727	6.79209	10.25170
Minimum	12.49985	14.40000	20.25053	7.226106	-2.40109	1.794189

Std. Dev.	0.314665	1.412236	0.972460	4.459749	2.23709	2.139023
Skewness	-0.504624	0.202671	-0.369580	0.742845	1.05964	1.221143
Kurtosis	1.703800	1.790301	1.563191	2.601628	4.278838	4.203484
Jarque-Bera	1.911589	1.152935	1.849302	1.675899	4.338498	5.250971
Probability	0.384507	0.561880	0.396670	0.432597	0.114263	0.072405
Sum	221.4332	280.1000	370.6357	229.2660	2.44410	79.81974
Sum Sq. Dev.	1.584227	31.91059	15.13085	318.2298	7.93319	73.20672
Observations	49	49	49	49	49	49

Source: By Author

5.3 CORRELATION MATRIX

Table 5.2 shows the relationship between investment and savings as a percentage of GDP, ODA, FDI inflows, portfolio investment and the repo rate.

Table 5.2: Correlation Matrix

Correlation						
Probability	GFCF	DSAV	ODA	FDI	PIM	REPO_RATE
GFCF	1.000000					

DSAV	0.372120**	1.000000				
	0.0413	-----				
ODA	0.179999*	0.495322***	1.000000			
	0.0894	0.0432	-----			
FDI	0.114955*	0.531387***	-0.479055***	1.000000		
	0.0604	0.0282	0.0517	-----		
PIM	0.126275*	0.030935**	-0.098804***	0.084863*	1.000000	
	0.0291	0.9062	0.7060	0.7461	-----	
REPO_RATE	-0.146478***	0.018657***	-0.561844***	0.368622**	-0.053274***	1.000000
	0.0748	0.9433	0.0189	0.1454	0.8391	-----

*** Correlation is significant at the 0.01 level of significance

** Correlation is significant at the 0.05 level of significance

* Correlation is significant at the 0.1 level of significance

Source: By Author

As illustrated in Table 5.2, the correlation between investment and savings as a percentage of ODA, FDI and portfolio investment is positive and significant. However, the correlation between investment and the repo rate is negative though significant which suggest that foreign capital to a greater extent supports investment in South Africa. However, the correlation between investment and the repo rate is negative and significant which is consistent with economic theory which proposes that there is a negative relationship between investment and interest rates. However, these preliminary results are insufficient to arrive at a conclusion. Further tests have been reviewed in the next sections.

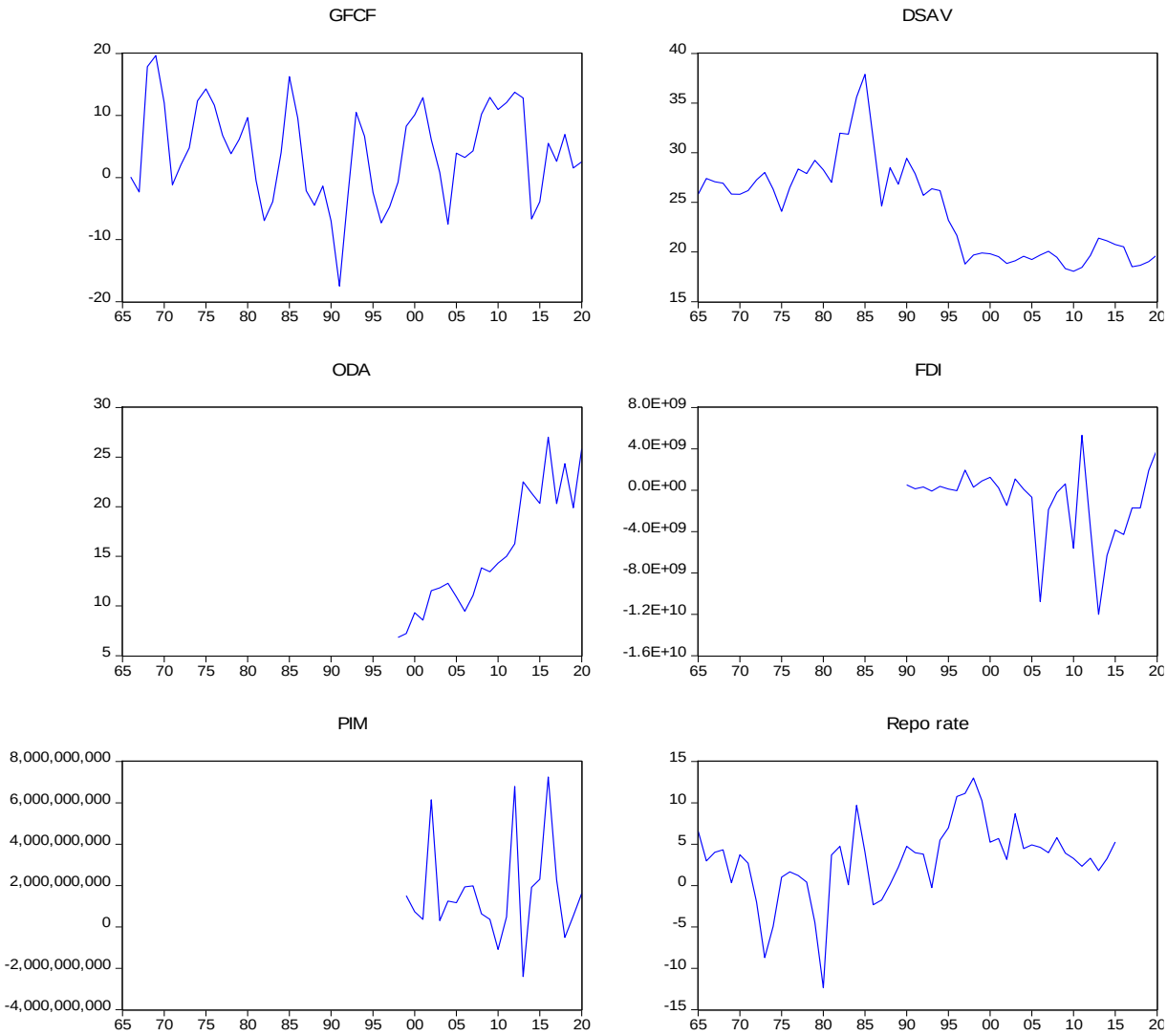


Figure 5.1: Graphical Plots of Key Variables at Level Series
Source: By Author

The graphical plots of the data in Figure 5.1 show that the key variables to be used in the study exhibit some evidence of non-stationarity as they trend. The same variables were examined at first difference and results are illustrated in Figure 5.2.

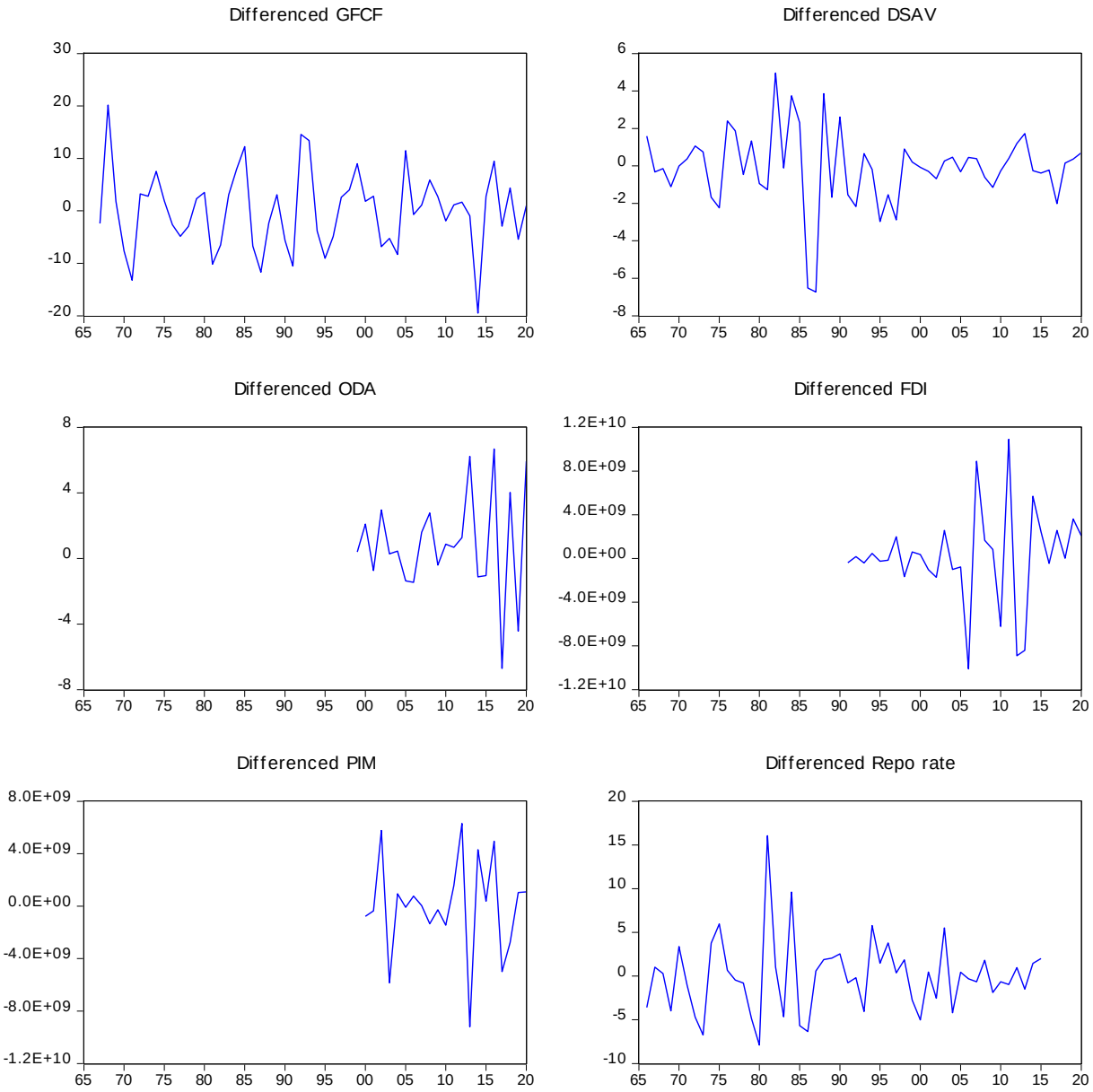


Figure 5.2: Graphical Plots of Key Variables at First Difference Series
Source: By Author

The variables show that there is some evidence that they revolve around their mean at first difference. This further implies that the variables are stationary in their first differences. The graphical plots are, however, regarded as informal tests, and formal tests are utilized in the analysis of the time series properties of the data in detail. This is discussed in Section 5.4.

5.4 UNIT ROOT TESTS (FORMAL TETS): LEVEL SERIES

The variables utilised in the study were checked for the presence of unit root using the ADF and the PP tests. The results shown in Table 5.3, indicates that both the ADF and the PP reports for all the variables used in the study were non-stationary. This suggests that the mean, variance and covariance of the series are not constant. The variables were examined for stationarity in first difference and the results are reported in Table 5.3.

Table 5.3: Unit Root tests at level series

Variables	Augmented Dickey Fuller-Test			Phillips-Peron Test		
	Intercept	Intercept and trend	None	Intercept	Intercept and trend	None
Portfolio investment(PIM)	-5.2524***	-5.1220***	-3.6738***	-5.8747***	-5.7654***	-3.6592***
ODA	-0.6541	-4.0501**	1.8455	-0.5568	-4.1138***	0.7885
FDI	-0.6599	-5.0935***	0.0244	-3.1525**	-5.0276***	-2.6033***
lgfcf	-0.3411	-1.2591	2.6811	-0.3411	-1.4793	2.6811
Repo rate	-3.6031***	-4.1038***	-2.9547**	-3.5610***	-4.1038***	-2.8379***
Savings to GDP	-1.9009	-3.0727*	-0.8493	-1.6772	-3.0482*	-0.9295

Note: *** 1% level of significance; ** 5% level of significance; *10% level of significance

Source: By Author

Table 5.4: Unit Root tests at first difference

Variables	Augmented Dickey Fuller-Test			Phillips-Peron Test		
	Intercept	Intercept and trend	None	Intercept	Intercept and trend	None
Portfolio investment(PIM)	-4.1331***	-3.9383**	-4.3061***	-18.7335***	-19.3428***	-19.3437***
ODA	-9.0244***	-8.7589***	-7.9427***	-9.3246***	-9.0420***	-7.6000***
FDI	-7.9586***	-4.2903***	-7.9180	-15.5712***	-14.9794***	-14.5420***
lgfcf	-5.1144***	-5.0486***	-4.5947***	-5.0865***	-5.0191***	-4.5947***
Repo rate	-5.5665***	-5.5022***	-5.6380***	-10.4059***	-10.2361***	-10.5530***
Savings to GDP	-8.3793***	-8.3054***	-8.4375***	-9.7819***	-9.8150***	-9.4883***

Note: *** 1% level of significance; ** 5% level of significance; *10% level of significance

Source: By Author

Table 5.4 shows that all the variables are stationary in first differences except for the FDI. Therefore, this suggests that all that was required was to difference the series once to make them stationary.

5.5 THE ARDL BOUNDS TEST

Given that the results of the unit root tests confirmed that the variables are integrated of I (0) and I (1), the ARDL approach to cointegration was estimated to analyse the long-run relationship between the variables of interest for the two time periods, 1960-1994 and 1995- 2015 as shown in Table 5.5 and 5.6, respectively.

Table 5.5: ARDL Bounds Test (1960- 1994)

ARDL Bounds Test				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	k		
F-statistic	6.888672	4		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.2	3.09		
5%	2.56	3.49		
2.5%	2.88	3.87		
1%	3.29	4.37		

Source: By Author

Table 5.5 reveals that the F-statistic of 6.89 is greater than the Upper Bound even at 1% level of significance. This means that there is cointegration between savings and investment in South Africa. This confirms that there is a long-term relationship between savings, FDI, ODA, portfolio investment, interest rate and investment in South Africa.

Table 5.6: ARDL Bounds Test (1995- 2015)

ARDL Bounds Test				
Null Hypothesis: No long-run relationships exist				
Test Statistic	Value	k		
F-statistic	5.429109	5		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.08	3		
5%	2.39	3.38		
2.5%	2.7	3.73		
1%	3.06	4.15		

Source: By Author

Table 5.6 shows that the calculated F-statistic of 5.43 is greater than the Upper Bound even at 1% level of significance. This therefore confirms the existence of cointegration between savings and investment in South Africa. This therefore means that a long-term relationship is present between savings, FDI, ODA, portfolio investment, interest rate and investment in South Africa. Having established cointegration, the long-run models for the two time periods were estimated and the results are reported in Table 5.7 and 5.8, respectively.

5.6 LONG-RUN COINTERGRATION RESULTS

Table 5.7: Long-run integration results (1995-2015)

Variable	Base Model (1960 – 1994)	Base Model (1995 – 2015)	Model With savings	Model with Financial Flows
Constant	2.034191	0.3539*	0.4158**	0.0549**
	(3.6739)	(5.0607)	(6.2883)	(4.8449)
DSAV	0.602577**	0.2971*	0.3944*	
	(0.0787)	(0.3211)	(0.1564)	
ODA	-0.235124**	0.0724**		0.3695*
	(0.1125)	(0.0988)		(0.3025)
FDI	0.758713**	0.0101***		0.0280**
	(0.2764)	(0.1005)		(0.1210)
PIM	1.196562***	0.0598**		0.5954*
	(0.3777)	(0.0510)		(0.0000)
REPO_RATE	-0.020267	0.0122*		
	(0.0343)	(0.3127)		

Notes:

Standard Errors in Parentheses

***, **, * represents significance at 1%, 5% and 10%, respectively [ ] P-values.

Table 5.7 shows the four models which were estimated in analyzing the relationship between investment and savings. For the period 1960 to 1994, the results show that the relationship between GFCF, DSAV, FDI, and PIM was positive, however, the relationship between ODA and the repo

rate was negative. The only difference between these two time periods is the fact that the repo rate and ODA have a negative relationship with GFCF.

In the base model for the period 1995 to 2015, the relationship between GFCF, DSAV, ODA, FDI, PIM and the repo rate was positive. This is in line with our apriori expectations, with the exception of the repo rate. These results are discussed in detail below.

The empirical results show that there is a positive and significant relationship between savings and investment in South Africa. These results are consistent with the apriori expectation and corroborate the findings of Mojsoska-Blazevski (2013). The B1 in this case is equal to 0.29 which suggests that apart from domestic savings and supporting investment, foreign capital flows have played a very important role in the country for the period 1995 to 2015 in promoting investment. These results are consistent with the findings of Jansen, Coakley and Kulas (1997), Afzal (2007), Grier et al. (2008), and Nasiru and Usman (2013).

The empirical results also show that for the period 1995 to 2015, the different types of external financial flows utilized in the study and investment have a positive relationship. These results are in agreement with the apriori expectation and other prior studies by Kumar (2007) and Bashier *et al* (2007). In addition, these results suggest that foreign capital flows augment domestic savings in South Africa. It is also interesting to note that, of the different types of external finance, FDI is the most significant statistically given a coefficient of 0.07. Usually overseas development assistance is channeled towards infrastructure development which in return attract other different types of investments. To add on, FDI also plays a very important role in promoting investment in South Africa.

An interesting result is that of interest rate which is significant at 10 per cent level even though it carries the wrong sign. This result is contrary to the finding of D'Adda and Scorcu (2001) who established a negative relationship between investment and interest rates. This indicates that in South Africa apart from interest rates there are other factors that determine investment.

Two separate models were estimated, the second model focusing on analysing the Feldstein-Horioka model only. The result is consistent with first model in that the savings coefficient is less than 1. This suggests that apart from domestic saving foreign capital plays a role in determining domestic investment as indicated in the third model.

5.7 THE ERROR CORRECTION MODEL (ECM)

Table 5.2: The ECM Model

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GFCF(-1))	1.348594	0.068798	19.602360	0.0026
D(GFCF(-2))	1.075230	0.069379	15.497878	0.0041
D(GFCF(-3))	0.543084	0.058760	9.242349	0.0115
DSAV	-0.002069	0.013757	-0.150380	0.8943
D(ODA)	-0.924702	0.172125	-5.372261	0.0329
D(FDI)	0.000000	0.000000	14.239560	0.0049
D(PIM)	-0.000000	0.000000	-1.669524	0.2370
D(REPO_RATE)	-4.081200	0.184040	-22.175561	0.0020
CointEq(-1)	-2.122434	0.077771	-27.290678	0.0013

Source: By Author

Table 5.8 reveals that an ECM term of 2.12 is significant at 1% level and carries the correct sign. This means that should there be disequilibrium, about 12% is corrected within a quarter. In the short-run, all the other variables are significant, however, with the exception of the savings variable. As a result, this suggests that savings in the short-run are not significant in explaining investment in South Africa, even though the variable carries the correct sign.

5.8 GRANGER CAUSALITY TEST RESULTS

Granger causality tests were carried out to determine if savings preceed investment and vice-versa. The results are shown in Table 5.9.

Table 5.9: Granger Causality/ Block Exogeneity tests

Dependent variable: D(LGFCF)			
Excluded	Chi-sq	df	Prob.
D(SAVINGS_TO_ GDP)	6.940618	2	0.0299
All	9.940618	2	0.0019
Dependent variable: D(SAVINGS_TO_GDP)			
Excluded	Chi-sq	df	Prob.
D(LGFCF)	4.618862	2	0.0339
All	10.18862	2	0.0039

Source: By Author

Table 5.9 shows that both savings and investment Granger cause each other. In other words, an increase in investment, results in an increase in savings. At the same time, savings also promote investment which is in line with theory and these results also confirm the apriori expectations and the long-run results.

5.9 DIAGNOSTIC TESTS

The residuals were also examined for the normality, autocorrelation and heteroscedasticity, and the results are reported in Table 5.10.

Table 5.10: Diagnostic checks

Test	H_0	Test Statistic	p-value	Conclusion
Jarque-Bera (Normality)	Residuals are normally distributed	0.27	0.88	Normally distributed
VEC Residual Serial Correlation LM Tests	There is no serial correlation in the residuals.	-0.27	0.83	No serial correlation
VEC Residual Heteroscedasticity Tests	The residuals are homoscedastic	0.11	0.9	No Heteroscedasticity

Source: By Author

Table 5.10 reveals that the results do not suffer from autocorrelation, non-normality or heteroscedasticity. The results obtained from the analysis are therefore robust.

5.10 CONCLUSION

This chapter focused on interpreting the results of models estimated in Chapter 4. The chapter began with analysing the time series properties of the data using three methods of testing for unit root. All of the three methods confirmed that the variables are integrated of order one, *I (1).* An ARDL bounds test was conducted and we found out that there was cointegration. Having established cointegration, the long-run model was estimated and an important result was that there was a negative relationship between GFCF and savings and this is contradictory to previous

studies. Moreover, the results revealed that FDI was crucial in promoting investment in South Africa. The results from the diagnostic tests were robust.

CHAPTER 6

CONCLUSION, POLICY RECOMMENDATIONS AND LIMITATIONS

6.1 SUMMARY OF THE STUDY AND CONCLUSION

The study examined the relationship between savings, investment and foreign capital in South Africa (SA). This study also reviewed theoretical and empirical literature review in which different studies focusing on different countries provided conflicting results with regards to the relationship between savings, investment and foreign capital. Most of the studies confirmed that there is cointegration between savings and investment and that the relationship between these two variables is stronger under the fixed exchange rate regime and weaker under floating exchange rate regime. It is also important to take note that there is still grey area in terms of studies that have looked at the application of the F-H hypothesis as far as South Africa is concerned. Based on the theoretical and empirical literature review that we have looked at, a model was established which formed the basis for empirical analysis of the research problem from the South African perspective. The variables that were utilized in examining the link between investment, savings and capital flows were period averages of investment and savings to GDP ratios, respectively. However, because of the short-fall between savings and investment in SA and the reliance on foreign capital, we had to augment the model to include additional variables, these being foreign capital, interest rate (repo rate), inflation and financial development.

In examining if whether a long-term relationship exists between saving and investment, the Autoregressive Distributed Lag (ARDL) was utilised due to its flexibility and the ARDL can also be used irrespective of whether the variables are of different order of integration. Before any empirical estimations were conducted, our variables were tested for stationarity using the unit root analysis and the results revealed that the variables are integrated of order one *1(1)*. Because the

unit root tests confirmed that the variables are integrated of I(0) and I(1), we estimated the ARDL approach to cointegration for the purposes of analyzing the long-run relationship between the variables of interest for the two time periods, 1960-1994 and 1995- 2015. The results revealed that cointegration exists between savings and investment in South Africa, which means that there is a long-term relationship between savings and investment in the country.

The long-run model was estimated after having established cointegration. Four models were estimated and these were base model for the two time periods, model with savings and model with financial flows. For the period 1960 to 1994, the results revealed that the relationship between GFCF, DSAV, FDI, and PIM is positive. However, the relationship between ODA and the repo rate is negative. Also, in the base model for the period 1995 to 2015, the relationship between GFCF, DSAV, ODA, FDI, PIM and the repo rate is positive. This was in line with our apriori expectations, with the exception of the repo rate. It was expected that there would be a negative relationship between investment and the repo rate.

There were also two separate models which were estimated, the second model focused on analysing the Feldstein-Horioka model only. The result was consistent with the first model in that, the savings coefficient is less than 1 which suggest that apart from domestic saving foreign capital does play a role in determining domestic investment as indicated in the third model.

Interestingly, the empirical results showed that interest rate is significant at 10 per cent level regardless of the fact that it carries a wrong sign. This is contrary to the finding of D'Adda and Scorcu (2001) who established a negative relationship between investment and interest rates. This suggests that, in the case of South Africa, apart from interest rates there are other factors that determine investment.

After establishing that cointegration was present, the Error Correction Model (ECM) was estimated. The main reason for estimating the ECM is that variables in the short-run may be in disequilibrium and are associated with the disturbances being the equilibrating error. The results showed that if there should be disequilibrium, then about 12% is corrected within a quarter. All the variables in the short-run were significant, except savings. Diagnostic tests were also conducted for purposes of robust check. The results revealed that the residuals do not suffer from autocorrelation, non-normality or heteroscedasticity.

6.2 POLICY IMPLICATIONS OF THE STUDY AND RECOMMENDATIONS

The positive relationship between investment and savings is an indication that savings have played a very important role in promoting investment in South Africa. The results also suggest that foreign capital has also played a crucial role both in the short-run and long-run. The Granger causality results also suggest that both investment and savings Granger cause each other. These results have a number of policy implications.

Firstly, there is need to come up with policies which are aimed at promoting savings in South Africa. These policies will ensure that the savings which are mobilized are channeled to productive sectors of the economy promoting investment and hence reduce the level of unemployment. Secondly, there is need to attract foreign capital flows to South Africa considering the role it has played in augmenting domestic savings. This will result in the country achieving higher levels of investment. Lastly, the results indicate that investment is also significant in contributing towards domestic savings. This is consistent with Hui-Boon (2000) who highlighted that an increase in investment enhances aggregate output and national income which will in turn induce further savings.

6.3 LIMITATIONS OF THE STUDY AND AREAS OF FURTHER RESEARCH

This study focused on the effect between savings, investment and foreign capital in South Africa. However, the most important limitation in successfully completing this study has been the scarcity in the availability of data for some variables. However, the variables utilized and the results obtained are in line with other available empirical studies and conforms to theory.

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