

THE IMPACT OF CAPITAL FLIGHT AND INVESTMENT ON ECONOMIC
GROWTH IN SOUTH AFRICA

by

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Dissertation submitted for the requirements for the degree of

MASTER OF COMMERCE

in

ECONOMICS

in the

FACULTY OF MANAGEMENT & LAW

(School of Economics and Management)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Prof IP Mongale

2018

DEDICATION

This dissertation is dedicated to the memory of my late Grandfather Mr Mankete Epaphras Sefomolo. May he's soul rest in peace.

DECLARATION

I Mokitimi Placid Mulaudzi declares that **“The impact of capital flight and investment on economic growth in South Africa”** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

.....

Signature

.....

Date

ACKNOWLEDGEMENTS

I would like to acknowledge the contributions of the following people for their support and contributions throughout this study:

- My Supervisor Professor IP Mongale for all his guidance, support and encouragement.
- My whole Family for the encouragement and support throughout this study. Especially my mother Miss MD Sefomolo and Father Mr DM Mulaudzi for their financial and moral support.
- My partner Ms SW Mmola for her unbelievable support and encouragement throughout my studies.
- My Friends Mr KD Matoba and Ms P Nhlangwini for all their contributions and words of encouragement.
- Last but not least the Almighty Lord for giving me the ability and strength to accomplish this milestone.

ABSTRACT

This study investigates the impact of capital flight and investment on economic growth in South Africa using time series data from 1986 to 2016. It employs the Auto Regressive Distributed Lag (ARDL) bounds testing procedure and the Granger causality test as a method of analysis. The empirical findings reveal that the variables are cointegrated which is an indication of the existence of a long run relationship among them. It was further discovered that capital flight had a negative long run relationship with economic growth while investment showed a positive long run relationship with economic growth. The terms of trade and inflation which were added to the model as control variable were also found to have a significantly positive influence on economic growth. The Granger causality indicated a bidirectional relationship between inflation and economic growth, while the terms of trade is found to have a unidirectional relationship with economic growth and capital investment respectively. The results are in line with the neo-classical growth model and the accelerator theory of investment.

KEY CONCEPTS: Capital flight, Investment, Economic Growth, Inflation, Terms of trade, Granger Causality, ARDL

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ACRONYMS

ARDL	Autoregressive Distributed Lag Model
ADF	Augmented Dickey Fuller
BOP	Balance of Payments
BRICS	Brazil Russia India China South Africa
CLRM	Classical Linear Regression Model
CPI	Consumer Price Inflation
DF-GLS	Dickey Fuller Generalized Least Squares
ECM	Error Correction Model
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
ICOR	Incremental Capital Output Ratios
IDC	Industrial Development Corporation
NPC	National Planning Commission
NDP	National Development Plan
RESET	Regression Specification Error Test
UECM	Unrestricted Error Correction Model
TOT	Terms of Trade
SARB	South African Reserve Bank

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Any country that is trying to realise an increased and sustained level of growth and development has to have access to sufficient capital. There is a general consensus that the shortage of capital is a major impediment for the development of the African continent. The lack of sufficient domestic capital emphasises the need of having a source of capital for Africa to fill the resource gap it faces (Olugbenga & Alamu, 2013). The low level of saving in most developing countries has meant that developmental objectives for them have been and are continually being funded externally (Al-Refai, 2015). Fofack (2009) argues that this need for capital has left no other alternative but the accumulation of huge sums of external debt. The existence of this external debt has been shown to have a compelling relationship with capital flight. Academia has been fascinated by the paradox that although Africa receives a substantial amount of developmental funds in the form of external debt and foreign direct investment, the continent simultaneously also experiences a significant financial loss in the form of capital flight (Ndikumana, et al., 2015). One example of this is South Africa.

The apartheid regime, which was hit by a heavy presence of economic sanctions and international segregation, borrowed heavily to finance a number of large investments in order to preserve itself (Mohamed & Finnoff, 2005). As the country transitioned into a democratic state, large sums of debt were inherited by the newly elected government. A shortage of domestic capital meant the government needed alternative sources of capital in order to pay off the inherited debt. In an effort to achieve low debt and higher growth levels, the government liberated the financial system in 1995 with the intention to reintegrate the economy with the world and boost economic growth by attracting foreign capital. This was done by re-abolishing the financial rand system and lifting all controls on non-resident investors (Tswamuno, et al., 2007). The results created the ability for capital to move in and out of the country with more freedom. The purpose of this was to increase the country's attractiveness to foreign investors in order to accumulate foreign capital and therefore attempt to stimulate sustainable

growth. This was also accompanied by enforcing tax reforms and fiscal discipline (Wesso, 2001).

However, reintegrating South Africa into the global arena at the end of apartheid brought its own risks. It increased the vulnerability of the economy to a financial crisis. This reintegration created an opportunity for more concealed capital movement (Mohamed & Finnoff, 2005). This increased vulnerability provided a reason for capital flight. A number of studies such as (Mohamed & Finnoff, 2005) (Fedderke & Liu, 2002), (Mahmood, 2013), and (Tswamuno, et al., 2007) have found that the introduction of financial liberation has ironically come with a considerably high amount of capital flight from South Africa. This flight of capital undermines the growth path of the country. The impact of capital flight on the economy is negative because of the foregone private investment, tax revenue and potential investment (Finnoff & Mohammed, 2004). Nevertheless, since its transition into a democratic state, South Africa has experienced an improved level of growth compared to the later stages of the apartheid regime. It is however still modest by economic history and international standards (Du Plessis & Smit, 2006). This modest growth average suggests that there is still room for improvement if South Africa is to reach its full potential. The existence of capital flight is seen as one of the underlying factors that need to be solved if this potential is to be fulfilled.

Capital flight is a problem that has been observed since 17th century (Makochekanwa, 2007). The phenomenon has however never been attached to a formal definition. Scholars have had contrasting views on what the term is because of different opinions on what it consists of. There has also been much debate on what the reasons of capital flight are, many scholars link it to the portfolio choices of rational investors or to the economic and political uncertainties that plagues most developing countries (Agu, 2010). A renewed interest has come because of the potential role that assets which are sent abroad as capital flight can play in the countries that they are fleeing (Makochekanwa, 2007). Especially in African countries that face high rates of unemployment and low levels of growth.

1.2 STATEMENT OF THE PROBLEM

The substantial transformation measures taken by the government since the fall of apartheid saw the economy grow at an average growth rate of 3.3% (IDC, 2013). However, after the 2008 financial crises a steady decline in growth can be observed. In 2016 the country grew by a disappointing 0.3 %. This has put increased pressure on government to recuperate the economy by dealing with the structural problems that continue to subdue growth. The continued presence of capital flight is seen as an additional challenge to policy makers because it dampens growth in the sense that it aggravates the scarcity of capital for a country by compounding on the lack of financial resources and thus creating an inability to increase investment (Makochekanwa, 2007). This means that capital for infrastructure development becomes subdued, dampening the growth prospects of the country.

According to the National planning commission (2013) to grow faster and in a more inclusive manner, the country needs a higher level of capital spending. Gross fixed capital formation needs to reach about 30 percent of GDP by 2030, with public sector investment reaching 10 percent of GDP in order to realise a sustained impact on growth and household services. If the country is to achieve these levels of investment by 2030, the problem of capital flight therefore needs to be addressed. For the period 1970-2010 Boyce & Ndikumana (2012) estimated the value of capital flight to have reached \$56 billion while Mohamed & Finnoff (2004) argue that capital flight has averaged 6.6% of GDP annually from 1980 to 2010. For their observation period, the accumulated amount of capital flight was 37% of the value of cumulative gross fixed capital formation. This suggests capital flight to be a real and a thriving economic issue for South Africa. Besides the foregone potential investment, capital flight also erodes the tax base because capital that is moved abroad often escapes the reach of local tax authorities (Henry, 2013).

1.3 RESEARCH AIM AND OBJECTIVES

The aim of the study is to investigate the impact of capital flight and investment on economic growth in South Africa.

Gross fixed capital formation will represent investment while economic growth will be represented by gross domestic product. With this in mind this therefore means, in order to achieve our aim, the following objectives are set:

- To estimate the volume of capital flight.
- To determine the impact of capital flight on economic growth.
- To determine the impact of gross fixed capital formation on economic growth.
- To determine the long and short run relationship between investment, capital flight and economic growth in South Africa.

1.4 RESEARCH QUESTIONS

By outlining the aims and objectives in the previous section the following questions arise:

- What is the volume of capital flight?
- What is the impact of capital flight on economic growth?
- What is the impact of gross fixed capital formation on economic growth?
- What is the long and short run relationship between investment, capital flight and economic growth in South Africa?

1.5 DEFINITION OF CONCEPTS

Gross Domestic Product (GDP): The gross domestic product is the monetary value of all goods and services that are produced within a countries' boarder over a specific period of time, usually a year and will be included as a measurement for economic growth (Brezina, 2011)

Economic Growth: Economic growth is the increase in the capacity of all goods and services produced within a countries border (Brezina, 2011).

Gross Fixed Capital Formation (GFCF): Also known as fixed investment is expenditure on fixed assets such as building and machinery. It is also expenditure for replacing or adding to the stock of existing fixed assets. It is an independent variable and it is included because it is seen as an injection into the economy (Black, et al., 2015)

Terms of trade (TOT): The terms of trade can be described as a ratio of the price of exports goods to the price of import goods. It is an index that helps show the position of a countries international trade (Carlin & Soskice, 2006).

Capital flight: According to Dooley (1986) capital flight is outflows that are held by non-resident, that are beyond the reach of local monetary and fiscal policies or do not yield an interest domestically. This figure will be the results of the calculated figure of capital flight using the residual method as outlined in the previous section. It is an independent variable and it is included because it seen as a leakage from the economy (Black, et al., 2015)

1.6 ETHICAL CONSIDERATIONS

This study will be conducted with the utmost care so as to avoid any intentional or unintentional harm of any participant or anyone that could be affected by this study, it is also written without any form of plagiarism or misinformation. All sources have been cited and acknowledged.

1.7 SIGNIFICANCE OF THE STUDY

This study attempts to show the relationship between capital flight, economic growth and investment in South Africa by adopting a quantitative design. Although theoretically this phenomenon can be explained, it appears that empirically not much research has been done on what the impact of capital flight is on the growth trajectory of South Africa. One of the important determinants for stimulating growth is investment but due to the shortage of domestic capital, South Africa like most African countries relies on foreign capital to supplement investment. Capital flight is theoretically understood to have a negative relationship with investment. It is therefore the aim of this paper to investigate the relationship that exists between capital flight, economic growth and investment. To the best knowledge of this study, no research has tried to encapsulate this relationship including the direct impact of capital flight has on economic growth and investment in the context of South Africa. The purpose is to assess this impact by estimating the amount of capital flight and empirically identifying its possible impact on economic growth and therefore the investment spending in South Africa. This study also intends to add to the existing body of literature on capital flight in Africa with South Africa as a case study.

1.8 STRUCTURE OF DISSERTATION

CHAPTER 1 ORIENTATION TO THE STUDY

CHAPTER 2 LITERATURE REVIEW

CHAPTER 3 RESEARCH METHODOLOGY

CHAPTER 4 INTERPRETATION OF FINDINGS

CHAPTER 5 SUMMARY, RECOMMENDATIONS, CONCLUSION

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The following chapter lays out the theoretical foundation of this research by firstly examining the conceptualisation of capital flight. The problem in identifying a universally accepted definition also means that an equal problem of measuring it accurately in a uniformed way exists, thus the different ways that scholars have devised in order to quantify capital flight are therefore also a part of our discussion. The possible causes of capital flight are also laid out. The chapter proceeds with a presentation of the theoretical framework of capital flight, investment and growth. The final section of the chapter presents the empirical review which will help identify a possible research gap.

2.2 CONCEPTUALISATION OF CAPITAL FLIGHT AND ITS DETERMINANTS

2.2.1 Conceptualisation

Capital flight is as a term that is digested differently by academia and policy makers. It is therefore important to point out that because of this; the term is yet to be attached to a universally accepted definition. The elusiveness of its conceptualisation is because it is not precisely clear what distinguishes capital flight from “normal” capital flows (Uguru, et al., 2014). This paradox has consequently lead to different measures and therefore different estimates of capital flight. The lack of cohesion in identifying a universally accepted definition is due to the asymmetry that exists between the ways the term is interchangeably used around the world. Some intellectuals consider outflows from developed countries as foreign direct investment, while the same activity is called capital flight when it is carried out by residents in a developing country (Ajayi, 1995). This dichotomy is because outflows are seen as a portfolio decision involving rational investors. The view is that investors in developed countries are seeking better returns abroad, while investors in developing countries are fleeing the risk of capital loss due to macroeconomic mismanagement and the political instability that is consistent with most developing countries.

The fact that capital flight can manifest itself as both licit and illicit is also one of the reasons why it is *inter alia* perceived in different ways (Epstein, 2005). Capital flight is considered to be licit when the transactions are reported and recorded accurately according to their fair value on the Balance of Payments (BoP) statistics. On the other hand, it becomes illicit when flows are not recorded or are intentionally misquoted on the BoP with the sole purpose of hiding the origin, destination and the ownership of the flows. The norm in literature is for capital flight and illicit financial flows to be used synonymously. However, Ndikumane, et al., (2014) point out that calculations of illicit financial flows often include more than what is captured as capital flight. Their argument is that the most calculations of illicit financial flows includes expenditure on imports which return into the domestic economy hence in such cases the two can't be considered the same as illicit financial flows are not always parked abroad.

It is evident, that even when the flows are recorded and they are legally correct, the definition is still as elusive. This is apparent from the wide range of definitions that have been presented by different scholars regarding capital flight. One of the earliest authors to try and conceptualise the term was Cuddington (1986) who viewed it as short term speculative transactions (hot money) that flee the domestic economy due to a hostile investment climate. He's argument was that capital flight is prompted by the adverse effects of a political or financial crises, burdensome taxes, oppressive constrictions in capital controls and a prospective (or actual) case of hyperinflation.

On the one end, however Morgan Guaranty Trust Company (1986) defined capital flight to comprise of reported and unreported acquisitions of assets by the non-banking sector and portions of the public sector. Khan & Haque (1987) defined capital flight as a response by domestic and foreign investors to the asymmetric risk of expropriation. Their assumption was that foreign investment had no cost and was a two-way flow of capital. According to them this two way flow existed because investors invested abroad to avoid a higher risk of expropriation but used these funds to finance domestic investment.

Dooley (1987) defined capital flight as the stock of claims on non-residents that doesn't cause investment income receipts in the creditor country's balance of payments statistics. His view is that this distinguishes normal capital flows (who's decisions are based on portfolio flows) from those funds that are exported abroad with the sole

purpose to move their wealth out of the control of domestic authorities. On a similar note Deppler & Williamson, (1987) distinguish capital flight by identifying its motives as different from those that prompt capital outflows. According to them, although both occurrences have a basis to maximize profits abroad. Capital flight is different because it is carried out solely because of concerns from residents that if wealth is continued to be held domestically, it would be subject to a huge loss or impairment. Their premise is that these fears arise because of market distortions such as taxation, exchange rate depreciations and financial repressions. Equally, their view on normal capital outflows is that they are motivated by attempts from residents to maximise returns through diversifying their portfolios internationally. With that in mind, their definition of capital flight is therefore based on their assertion that the difference of capital flight from capital outflows is a response to a prospective loss rather than shifting capital abroad for a higher return.

One of the conventional definitions of capital flight is by Schineller, (2003) who simply defines capital flight as outflows of resident capital from a country due to economic and political risk in the domestic economy. Epstein (2005) however views capital flight as a political phenomenon where investors are exporting funds abroad solely because of the negative impact that government policies and government controls could have on their wealth. His perspective emphasizes the role of an unstable political environment in inducing capital flight.

The differences in the way capital flight is defined by scholars is evident from the wide array of definitions that have been presented in the literature above. This empirical literature however indicates a general view that capital flight is capital that is fleeing the domestic economy in order to avoid losses and is in conflict with society's interest, goals and objectives. A loss in the welfare of a nation is realized and is considered to be a disadvantage by national authorities (Harrigan, et al., 2007). As far as this study is concerned capital flight is considered to be an evacuation of private capital by residents in a particular country to another because of the potential risk of capital loss due to an unfavourable economic climate and the detrimental effects of a government's policy direction.

In an effort to align all these definitions, table 1 by Lessard & Williamson (1987) provides taxonomy of factors explaining the flow of international capital. The upper left

quadrant is a list of the various factors that present differences in economic returns across countries. The upper right quadrant shows the additional factors that deal with the two-ways flows “normal” portfolio diversification. It is important to point out that most literature deals with the factors that are listed in the lower left and right quadrants. These factors are those that create a wedge between economic and financial returns” irrespective of “whether they operate across the board or asymmetrically among residents or non-residents” (Lessard & Williamson, 1987). It can therefore be argued that to this end, normal capital outflows occur because of the need to maximise economic returns and better opportunity between countries. Normal portfolio diversification occurs because of the differentials in economic returns. Capital flight however is considered from this analysis as those subsets from capital outflows that a driven by the policies of the source country (Lessard & Williamson, 1987).

Table 2.1: Taxonomy of factors explaining international capital flows

	One-way flows	Two-way flows
Economic risks and returns	<ul style="list-style-type: none"> • Natural resource endowments • Terms of trade • Technological changes • Demographic shifts • General economic managements 	<ul style="list-style-type: none"> • Differences in absolute riskiness of economies • Low correlation of risky outcome across country • Differences in investor risk preferences
Financial risk and returns	<ul style="list-style-type: none"> • Taxes (deviations form world levels) • Inflation • Default on government obligations • Devaluation • Financial repression • Taxes on financial intermediation • Political instability, potential confiscation 	<ul style="list-style-type: none"> • Differences in taxes and their incidence between residents and non-residents • Differences in nature and incidence of country • Asymmetric application of guarantees • Different interest ceilings for residents and non-residents • Different access to foreign exchange denomination claims.

Source: Lessard & Williamson (1987)

2.2.2 Determinants of capital flight

Below is a variety of economic reason as to what exactly is considered to be the determinants of capital flight. The reasons are therefore summarized and outlined below as:

2.2.2.1 Political Instability

A country with a politically unstable environment is viewed to be conducive to the flight of capital because residents faced with such a climate tend to seek safer avenues for their wealth in order to avoid government actions damaging the future value of their assets (Lensink, et al., 1998). Although in a study based on South (Mohamed & Finnoff, 2005) observed an increased level of capital flight in South Africa during a period characterized by less political instability than one with more political instability, this suggests that other factors other than political instability can be the cause of capital flight. A country that is perceived to have a high level of corruption and a lack of confidence in the domestic political situation is likely to experience capital flight (Ifedayo & Olawale, 2015). This seems to be a fitting statement for the high levels of capital flight in a more politically stable environment for South Africa.

2.2.2.2 Interest Rate Differentials

International capital flows are to a large extent affected by the differences in interest rates across the world, a rise in long term domestic interest rates may lead to capital inflows while a fall in interest rates may lead to capital outflows (Baumol & Blinder, 2015). Interest rate differentials could prompt domestic investors to move their capital abroad in an attempt to maximize the profit of their portfolios. In an effort to maximize profits domestic investors may seek foreign assets that yield a higher interest and thus a higher profit on short-term instruments (Ali & Walters, 2011).

2.2.2.3 Public Policy Uncertainty

The uncertainty of public policy impacts domestic wealth holders through the risk and uncertainty that swift changes in policy may have. The type of macroeconomic policies that the government implements for a particular country influences the domestic climate (Ali & Walters, 2011). If the direction of current and prospective public policies

are not stable or certain domestic investors who sense the danger will be prompted to move their capital abroad. This is because if the particular impact that those policies changes will have on value of their domestic assets in the future is perceived to be negative, investors will seek safer avenues. Policy uncertainty may thus prompt domestic investors to move their investments abroad and in turn cause capital flight due to the risks that it presents (Hermes & Lensink, 2001).

2.2.2.4 External Debt

According to Boyce (1992), the causality of capital flight and external flight can manifest itself in four different ways: Debt-Driven Capital flight which is when external borrowing increases the possibility of a debt crisis which in turn deteriorates the macroeconomic conditions and therefore creates a negative outlook on the investment climate, Debt-Fuelled capital Flight which is when foreign borrowings provide the incentive for taking private capital outside the country, Flight-Driven external Borrowings is when capital flight causes a shortage of foreign currencies forcing the government to borrow the shortage out of the country and flight fuelled external borrowing which is when capital flight offers the funds to finance foreign loans to the same people that move capital abroad, this phenomenon is also called "road-tipping" (Ndikumana & Boyce, 2003).

2.2.2.5 Macroeconomic Instability

The existence of an excess of aggregate demand on a structural basis within a country is conducive to an environment that is experiencing macroeconomic instability. A country that experiences macroeconomic instability is characterised by a rise in budget deficits, current account increases, exchange rate overvaluations and high inflation; all of which create an environment that is contributing to capital flight (Hermes & Lensink, 2001).

2.2.2.6 Inflation

When the rate of inflation in a particular country becomes proportionally high the value of domestic assets decreases and it becomes beneficial for domestic wealth holders to hold their assets abroad as a way of protecting the value of their wealth (Ifedayo &

Olawale, 2015). The causality between inflation and capital flight runs both ways because as capital flight occurs, it erodes the tax base and government may resort to creating money in order to finance the fiscal deficits which may result in a higher rate of inflation (Ndikumana & Boyce, 2003).

2.2.2.7 Exchange rate overvaluation

When the exchange rate of the country is overvalued a fear and expectation that a future devaluation of the domestic currency will occur gives domestic wealth holders the incentive to move their wealth outside the country as a way to deter the losses that may occur due to the expected depreciation of the domestic currency (Ndikumana, et al., 2015)

2.2.2.8 GDP Growth Rate

The GDP growth rate is the increase in the monetary value of all goods and services that are produced in a particular period of time and is usually calculated on an annual basis, the figure is seen as an indication of how fast and how much a particular economy is growing. There is therefore *a priori* expectation that a negative relationship between the GDP growth and capital flight will exist (Ndikumana & Boyce, 2003)

2.2.2.9 Capital flight

Ndikumana & Boyce, (2003) argue that countries that experience a prevalence of capital flight face the possibility of experiencing even more capital flight in the years to come due to the momentum that is created by capital flight itself.

2.3 MEASUREMENTS OF CAPITAL FLIGHT

As discussed earlier, finding a method that can measure the exact amount of capital flight has been a challenge for academia because of the different definitions. This is perhaps captured correctly by William, (2013), who submits that measuring capital flight is like holding sand in your hand; some of the particles always fall through. From

these various definitions, a number of methods are found in literature as a guide to measure capital flight. They are presented as follows:

2.3.1 The Dooley Method

The Dooley method can be attributed to the work of Dooley (1987). The method is an indirect measure of capital flight that utilises BOP figures by distinguishing between legal and illegal capital flows.

The Dooley Method captures capital outflows as:

$$TKO_t = FB_t + NFI_t - DWBIM_t - CAD_t - NEO_t - FR_t \quad 2.1$$

Where t denotes the specific time period, TKO is total capital outflows, FB is Foreign Borrowings, NFI is net foreign investment, $DWBIM$ is the difference between the IMF and World Bank's data on the changes in the stock of external debt, CAD is the current account deficit, NEO is net errors and omissions and FR is the official foreign reserves.

External Assets are calculated by the ratio:

$$EA_t = EI_t / UDR_t \quad 2.2$$

Where EA denotes External assets, IE is interest earnings and UDR is the United States deposit rate. Capital flight becomes:

$$KF_t = TKO_t - EA_t \quad 2.3$$

Where KF denotes capital flight, TKO is total capital outflows as calculated by equation (1) and EA is the external assets obtained as a ratio of interest earning to the United States deposit rate as calculated by equation 2.2.

2.3.2 The Hot Money Method

The Hot Money method and sometimes referred to as the narrow measure can be attributed to the work of (Cuddington, 1986). It is referred to as the hot money because capital flight is viewed as capital exports by the private non banking sector (even though capital exports can be made by the banking sector) that are short-term in nature. Capital flight is referred to as short-term speculative capital outflows that are a result of political or financial crisis, heavier taxes, and the devaluation of the local currency, hyperinflation (whether expected or actual) and a potential constriction of capital controls. In this method the presence of errors and omissions are regarded as important because financial transactions are often recorded imprecisely in the countries' balance of payments.

He interprets capital flight in the following equation:

$$KF = KE + EO \quad 2.4$$

Where KF denotes capital flight, KE is capital export by the non-banking sector and EO refers to errors and omissions which refers capital flows that are not recorded.

2.3.3 The Trade Misinvoicing Method

Trade Misinvoicing is the viewed as a huge contribution to the illegal component of capital flight, it is the intentional misreporting of exports by business to hide their actual earnings to hold the difference in foreign accounts or the misreporting of imports by business in order to have extra foreign currency from banking institutions and for the same reason as exports put the difference in offshore accounts ((Ajayi & Ndikumana, 2015). In their study (Patnaik, et al., 2012)measure trade invoicing by comparing two trading partners, where the country is named as ci with the trade partner viewed as the rest of the world. The trade misinvoicing equation is therefore interpreted as:

$$X_{mis} = X_{ctry} - M_{world} / ax \quad 2.5$$

$$M_{mis} = M_{ctry} / ax - X_{world} \quad 2.6$$

Where X_{mis} in equation (6.5) denotes exports that are misinvoiced, X_{ctry} are the exports as reported by the country C_i , and M_{world} is imports from country C_i . M_{mis} in equation (6.6) denotes the imports that are misinvoiced by country C_i , M_{ctry} is the imports reported by country C_i and X_{world} is the exports that are sent to country C_i . The ax denotes the CIF/FOB correction factor; where CIF is cost of insurance and FOB is Free on board which is without transaction.

2.3.4 The Residual Method

The residual method is obtained from the world development report by the World Bank(1985). It is an indirect measure of capital flight that is calculated using the difference between the uses and sources of capital inflows from balance of payment statistics. The sources of capital flows are viewed as net foreign investment or net increases in foreign borrowings and the uses of capital flows are viewed as current account balances or the changes in foreign reserves. Due to the fact that the balance of payment statistics is not sufficient to capture the extent of foreign borrowings, the World Bank used its world debt tables to measure the changes in foreign borrowings. In essence, capital flight in this version is measured as:

$$KF = FB + FDI - CA - \Delta FRES \quad 2.7$$

where KF denotes capital flight, FB is foreign Borrowings, FDI is foreign Direct Investment, CA is the current account balance and $\Delta FRES$ denotes changes in foreign reserves.

The residual method is viewed as a superior method of calculating capital flight because the hot money method by Cuddington (1986) does not account for the fact that investors may choose different types of assets abroad such as long-term and real assets. Another reason is because errors and omissions include true measurement and rounding errors, unreported imports and regulation delays (Khant, 1998). Although this method is widely accepted by many economic literatures as a way of measuring capital flight there has been criticism of the fact that this measure does not account for the fact that foreign borrowings may be affected by exchange-rate revaluations, debt

reclassification and relief, and discoveries of existing debt (Khant, 1998) However due to its popularity and straightforwardness this method is what this study will adopt as it is regarded as one of the best ways to calculate capital flight (Makochekanwa, 2007).

2.3.5 The Morgan Guaranty Trust Company

Morgan Guaranty (1986) extends the residual method further by assuming that banks are not involved in capital flight and therefore includes a subtraction of the change in short-term foreign assets of the domestic banking system (ΔB)

$$KF = FB + FDI + CA - \Delta FRES - \Delta B \quad 2.8$$

All symbols in equation 2.8 hold the same representations as those in the residual method.

2.4 THEORETICAL FRAMEWORK

2.4.1 Theories of Capital flight

Theories of capital flight can be credited to the work of Pastor, (1989) and (Ajayi, 1992) who together have identified four main theories. These theories are namely the investment diversion thesis, debt-driven capital flight thesis sometimes called the debt-overhang thesis, tax depressing thesis and austerity generating thesis.

2.4.1.1 The Investment Diversion Thesis

The investment diversion theory suggests that the existence of capital flight is due to the existence of macroeconomic and political uncertainty that occurs in developing countries at the same times as the existence of superior investment opportunities that exists abroad. These better opportunities may include higher interest rates, a wider variety of financial instruments to explore, political and economic stability, better tax rates and the ability to have secret accounts to store wealth. It is often the case that some of the dishonest and corrupt leaders who are in government often siphon the already scarce capital from their countries to the more advanced countries. These funds become unavailable for the funding of investment projects in their resident

countries which leads to a decrease in investment spending, low economic growth and therefore a decline in employment, increase in the dependency ration and a high death rate. These factors often lead to the need to acquire external funding in order to boost the domestic economy. These borrowed funds are sometimes also wasted which creates a further dependency on foreign countries. The liquidity constraint (crowding-out effect) may also result in deterioration of the local currency if a floating exchange rate system is in use (Ajayi, 1992). Any attempts to protect the exchange rate leads to a loss in foreign exchange reserves. This theory therefore gives the one of the well-known negative consequences of capital flight.

2.4.1.2 The Debt Driven Capital Flight Thesis

The debt driven capital flight thesis is a continuation of the investment diversion theory. The thesis holds that countries that have a presence of huge sums of external debt give reason to its residents to move their resources outside to foreign countries. This theory postulates that external debt can be considered to be a fuel of capital flight and thus reduces the incentive for saving and investing inside the country. The position taken here is that the existence of large sums of external debts creates an expectation of exchange rate devaluations, fiscal crisis, and the expropriations of assets in order to finance debt and the crowding out of domestic capital. So according to this theory capital flights results in sluggish growth, which creates the need to borrow in order to stimulate growth, the borrowing in turn leads to more capital flight and this cycle is perpetuated (Ajayi, 1992). The theory puts forward that a correlation between growth, capital flight and external debt exists.

2.4.1.3 The Tax-Depressing Thesis

This thesis holds that the existence of capital flight results in a reduction in the revenue generating potential of the government because it leads to capital that is taken abroad being beyond the reach of domestic tax authorities. This fall in tax revenue because of capital flight results in a fall in the ability for the government to service its debt and this therefore increases the debt burden which subdues the growth and development of these countries (Pastor, 1989).

2.4.1.4 The Austerity Thesis

This thesis proposes that the poor suffer more in severely indebted countries due to capital flight. The assumption is that the poor carry the burden because as austerity measures are taken by the government in order to pay for debt obligations and interest payments to international banks austerity measures are enforced and the poor carry the burden more due to their proportionally smaller incomes (Pastor, 1989). The irony of this is that while the government is busy paying off its liabilities to these international banks, the banks are also simultaneously paying interest to the capital flight they receive from the same countries

2.4.2 Theories of Growth

Economic growth was a central feature of the work of English classical economists; however Adam Smith, Thomas Malthus and David Ricardo must be regarded as the main forerunners of others before them (Snowdon & Vane, 2002). Their investigation was pinned against the background of a new economic system that was referred to as the system of industrial capitalism. Philosophically their main interest was mainly concerned with the progress of the material base of society. Ricardo was mainly concerned with Corn Laws, Malthus was concerned with the problem of population growth and Smith attacked monopoly privileges associated with mercantilism (Nafzinger, 2006). The work of these classical economists helped underpin broad forces that influenced growth. An important achievement was their recognition that accumulation and productive investment was an important determinant of economic growth. This would take the form of reinvesting profits (Harrison, Nd). Famous economist Adam Smith advocated for non-government intervention in the economy and a free-trade policy except where monopolies existed in the labour, capital, and product market. The classical model also took into account the importance of paper money. From the foundation of the classical economists, below we discuss some of the contemporary theories on growth. The theories are the Harold-Domar growth model, neoclassical growth model and the endogenous growth model.

2.4.2.1 Harrod-Domar Growth Model

The Harrod-Domar model which states that technological progress is determined exogenously pointed out the significance of capital accumulation in the quest for an enhanced level of output (Nafzinger, 2006). The work of this model can be credited to the work of Evsey Domar and Roy Harrod. Within the Harrod-Domar framework the growth of real GDP is viewed to be proportional to the amount of investment spending (I) in GDP. It is the view of this model that for an economy to grow, net additions to the capital stock are a necessity. The relationship between the amount of total capital stock (K) and total GDP (Y) is known as the capital output ratio ($K/Y=v$). If we were to assume that total new investment is due to the total savings then the Harrod-Domar model can be set out in the following way (Krugman & Wells, 2013). Let us assume that the total saving (s) is a proportion of GDP, as shown in the equation bellow:

$$S = sY \quad 2.9$$

Since investment spending can be defined as the change in the amount of capital stock (assuming no depreciation) this therefore means that:

$$I = \Delta K \quad 2.10$$

Given that we have already set up $v=K/Y$, it also means that we can assume that $v=\Delta K/\Delta Y$. This is called the incremental capital output ratio(ICOR). The fact that we assume all savings are spent on investment means that $S=I$. we can rewrite this equation as:

$$S = sY = I = \Delta K = v\Delta Y \quad 2.11$$

Simplified this equation may be written as:

$$sY = v\Delta Y \quad 2.12$$

Rearranged this can be written as:

$$\Delta Y/Y = G = s/v \quad 2.13$$

Here $\Delta Y/Y = Y_t - Y_{t-1}/Y_t$ is the growth rate of GDP. By allowing $G = \Delta Y/Y$ we have formulated the Harrod-Domar growth equation, $G = s/v$. What this equation and

theory states is that the growth rate (G) of GDP is jointly determined by the savings ratio(s) divided by the capital output ratio (v). The higher the savings ratio and the lower the capital output ratio (v). The faster the economy will grow. If we were to allow for the capital stock to depreciate (δ) than the equation becomes:

$$G = (s/v) - \delta \quad 2.14$$

The inception of the Harrod-Domar model was key to economic literature. Its implications were that if developing countries were to simply increase the share of their resources which are devoted to investment spending living standards would increase (Snowdon & Vane, 2002).

2.4.2.2 Neoclassical Growth Model

According to (Nafzinger, 2006) the Nobel Prize winner economist Robert Solow is credited for formulating the neoclassical theory of economic growth. Robert Solow's neoclassical growth model has three assumptions which are (1) The labour force and labour productivity growth increase at a constant exogenous rate (2) Every saving is invested which means that there exists no independent investment function and (3) output is a Cobb-Douglas function of capital and labour inputs (Thrillwal, 2013). This theory emphasises the significance of savings and capital formation with respect to economic development, and for practical measures for the causes of growth. Distinct from the Harrod-Domar model of growth, Solow allowed interest rates, replacements of labour and capital for each other, variable factor proportions, and flexible factor prices to change. He proved that it is not necessary for growth to be unsteady due to the fact that, as the labour force grew more than capital, wages would decrease relative to the interest rate or if the opposite happened and capital grew more than labour, wages would therefore increase. The changes in factor prices and the substitutions of factors led to the departure from the Harrod-Domar growth theory. Solow utilised the Cobb-Douglas production function to distinguish among the sources of growth- labour quantity and quality, capital, and technology (Nafzinger, 2006). The equation is

$$Y = TKL^\alpha$$

2.15

where Y is output or income, T the level of Technology, K capital, and L labour. T is neutral because it increases output from a given combination of capital and labour without affecting the relative marginal products. The parameter and exponent α is $(\Delta Y/Y)/(\Delta K/K)$, the responsiveness or elasticity of output with respect to capital *ceteris paribus*.

2.4.2.3 Endogenous Growth Model

During the 1980s economists were really concerned by the neoclassical approach that leaves a few questions unanswered regarding economic growth. They questioned the notion that technological change was exogenous from an economic point of view. The rate of change of technology was understood to have an economic explanation. They also questioned how economic growth was exogenous in the long run according to the neoclassical point of view (Gylfason, 1999). Robert Lucas of the University of Chicago finds that the differences in wages and migrations around the world seem to be in contradiction with the neoclassical growth theory. If the same levels of technology existed globally, human capital would not migrate from more developed nations where human capital is scarce to developed countries where human capital is abundant as is the case today (Nafzinger, 2006). The endogenous growth theory is drawn from the premise that growth is a product of growth itself and also because of the intended or unintended consequences of profit driven activities of private firms (Snowdon & Vane, 2002).

2.4.3 Theories of Investment

Carlin & Soskice (2006) argue that “From an economics point of view investment describes the spending on manufactured supports to production like plant and machinery, infrastructure and so on.” Investment spending comes in a variety of ways, the most important distinction to make is between public and private investment. Public investment refers to investment undertaken by the public sector, the basic rationale for this type of investment is to finance projects for which the benefits that a private investor could derive are too little to make the project profitable but the benefits to

society a relatively large. Public investment places the foundation for an environment that is conducive for sustainable growth but it is the private investment that provides the dynamics for a wide variety of new technologies, new jobs and growth in output (Baumol & Blinder, 2015).

2.4.3.1 The neoclassical theory of investment

The neoclassical theory of investment can be credited to the work of Jorgenson who in 1967 proposed that investment behaviour is determined by the optimal capital stock level. The equation for this theory was developed from the profit maximisation theory of the firm. The formal model is represented by the equations below which are present values of future returns:

$$PV = \int_0^{\infty} e^{-rt} [pY - wL - qI] dt \quad 2.16$$

$$s.t. \quad 2.17$$

$$Y = Y(K, L) \quad 2.18$$

$$NI_t = I_t - \delta K_{t-1} \quad 2.19$$

These are subject to a production function and a definitional relationship that net investment is equal to the gross investment minus depreciation (constant proportion of capital stock). This therefore gives:

$$K_t^* = K_t^*(w_t, c_t, p_t) \quad 2.20$$

and

$$I_t^* = I_t^*(w_t, c_t, p_t, K_{t-1}) \quad 2.21$$

where I is gross investment, Ni net investment, Y is output, p is output prices, K is capital stock, L is labour, w is wage rate, c is the user cost of capital, r is the rate of interest, q is the price of investment goods, and asterisks shows the planned values. The user cost of capital is represented by:

$$c_t = q_t(r_t + \delta) - (dq_t / d_t). \quad 2.22$$

What this means is that the user cost of capital is the opportunity cost of tying funds (q_t) in the capital good plus the amount of capital good that depreciates minus the capital gain of any increase in the price of the capital good. This model gives investment as a function of relative prices and lagged output.

2.4.3.2 The accelerator theory of investment

The Accelerator theory of investment proposes that an increase in income or demand within an economy should also result in an increase in investment made by firms. The theory proposes that as the level of demand increases it creates a situation where there is excess demand and there are two options for the firm to manage the demand, the firm can either increase prices which would decrease demand or to increase its investment in order to meet demand which would inevitably mean more profits (Krugman & Wells, 2013). The theory also determines that this growth attracts further investors which in itself further accelerate growth (Khanu & Ozurumba, 2014). What this implies is that given a fixed capital-output ratio, v , the desired capital stock is therefore:

$$K_t^* = v\Delta Y_t^e \quad 2.23$$

where k_t^* is the desired capital stock in period t , the capital-output ratio is v and Y_t^e is the expected output in period t . according to this theory investment is therefore given by:

$$I_{nt} = \Delta K_t^* = v\Delta Y_{t+1}^e \quad 2.24$$

Where I_{nt} is the net investment in period t . It is assumed that investors base their expectation of future output on the basis of output in the current period. This therefore gives:

$$I_{nt} = v\Delta Y_t \quad 2.25$$

The above is referred to as the simple accelerator theory of investment. This is because it does not account for the fact that there might be lags in the investment

decision making process. The flexible accelerator theory adapts this model to allow for the effects of lags in decision making. It is presented as:

$$I_{nt} = v \sum_{j=0}^{\infty} \beta_j \Delta_{t-j}; \quad 2.26$$

What the above equation does is to introduce a lag on the output growth term. In this way the flexible accelerator theory allows that effects of past output growth are spread over time.

2.4.3.3 Tobin Q-Theory of Investment

James Tobin a Nobel prize winning economist went beyond the acceleration and neoclassical theories of investment; He argues that net investments are dependent on variable he called Tobin's. He defines it as:

$$Q = \frac{\text{Market value of installed capital}}{\text{Replacement cost of installed capital}} \quad 2.27$$

The equations Numerator s determined by the conditions in the stock market and the denominator is determined by the current prices of capital assets. If Q is greater than 1, the stock market has put in more capital than its replacement costs the firm may therefore increase the value of its stock by purchasing more capital assets which would increase net investments. If Q is less than 1, the stock market has put in less capital than its replacement costs and the firm may therefore decrease its stock by not purchasing capital which would decrease net investment (Snowdon & Vane, 2002). The Q theory is in agreement with the neoclassical theory. The neoclassical theory the firm is likely to invest when its marginal physical product of capital is more than its real cost of capital which is when it would have incurred gains from a new investment. Tobin Q theory and neoclassical theory imply that an investment would be a reality for firms when profit rates are positive (Gupta, 2005).

2.5 EMPIRICAL LITERATURE

The empirical literature section includes a number of academic literatures that have studied the impact of capital flight on macro-economic variables, the studies are discussed below:

In a study that examines the impact of capital flight on investment and growth on Trinidad and Tobago. Salandy & Henry(2013) use two estimation techniques for econometric analysis. The Vector Error Correction (VECM) for the short-run and long run analysis and the Generalised Method of Moments (GMM) with an observation period of 1971-2008. Their results show that there is a negative relationship between capital flight and their two variables which are economic growth and investment. Their recommendation is that policy that is done with the aim of reducing capital flight will have a positive effect on domestic investment which would result in a positive and increased trajectory in economic growth.

Ali & Walters (2011) examine the causes of capital flight from sub-saharan Africa using a panel Data set consisting of 37 african countries for the period 1980-2005. The approach looks at capital flight from the portfolio choice theory. They discuss how illogical according to economic theory for capital scarce countries to lack the ability to retain capital as their marginal returns should be relatively higher. Their empirical evidence suggests that private capital flight from Africa is explained by distortions in policy, relative riskiness and the poor profitability of investments. Their study also finds that the type of resource flows to the region are important for capital flight and that foreign aid discourages capital flight but on the other hand short-term borrowings and FDI encourage it.

A study by Mahmood (2013) quantifies capital flight in Pakistan for the period 1972 to 2013 using the trade invoicing method to examine the extent of capital flight throughout four exchange and trade phases that Pakistan went through in different periods. These phases include a period where Pakistan went through a fixed exchange rate regime with partial lifting of trade controls, a managed floating exchange rate and liberalisation of initiatives, a multiple exchange rate system which also included dirty float regimes and a flexible exchange rate system with trade liberalisation. The findings of the paper

are that, contrary to many views that external funds lead to capital flight, in the context of Pakistan a reverse in capital flight occurs. It is argued that the illicit inflow complements the resources received by the country in the form of foreign loans, foreign investment and the country's foreign exchange earnings even though illicit flows are largely injected in the black market. He finds significance in the fact that reverse capital flight occurred in the period of trade and exchange liberalisation because it indicates that when strong regulatory bodies existed the system allowed private citizens to take advantage of trade and exchange laws.

The empirical paper by Ifedayo & Olawale (2015) studies the impact of capital flight on economic growth in Nigeria for the period 1980 to 2012. This study employs the estimation techniques: co-integration, ordinary least squares (OLS) and error correction mechanisms (ECM). Their tests show that capital flight, foreign reserves, external debt, foreign direct investment and the current account balance co-integrate with Gross Domestic Product (GDP) in their study period. Their OLS and ECM results reflect that capital flight had a negative impact on the economic growth trajectory of Nigeria and advise that government should foster an environment that is conducive for profitable investments, and should also have an incentive attracting foreign investors to counteract the prevalence of capital flight in order to create sustainable growth and development in Nigeria.

In a study based on South Africa Mohamed & Finnoff (2005) estimate the extent of capital flight for the period 1980 to 2000. They do so by adopting an indirect approach called the residual or broad measure. This technique estimates capital flight based on a comparison between the sources and uses of foreign exchange. Although the general perception is that political and economic instability may lead to capital flight, they find the contrary is true for South Africa. Their study shows that during the more politically and economically unstable period (1980-1994) South Africa has a lower degree of capital flight than in the more politically and economically stable period (1994-2010). They suggest the easing of capital controls by the democratic government to reintegrate South Africa into the global economy, the lack of trust in the government by the wealth holders: which is fuelled by the persistently high levels of inequality and poverty could explain the paradox of a relatively higher degree of capital flight post democracy. Mohamed & Finnoff also point at the structural setting of the

economy being one of the other reasons why wealth holders would rather keep money abroad than invest it locally.

In a paper on Capital flight and economic development in Africa, Ajayi (2014) employs a broad perspective on the analyses and implication of capital flight on economic growth and development in Africa. The study takes off by providing an overview of why capital flight limits and destabilizes economic growth and development in Africa because it creates a resource gap which aggravates sustainable growth and development. The analysis distinguishes between economic growth and development and dwells deeper on social development issues which is measured by the Human Development index (HDI) and economic transformation. The study goes further by dealing with the implications of inequality and poverty on development policy. His findings are that Africa has a substantial resources gap that needs to be closed to create an environment that is conducive for sustained growth and development. He also finds that because Africa is looking outside for resources it has become a net creditor to the rest of the world.

In a study attempting to explain capital flight from sub-Saharan Africa Boyce & Ndikumana (2002) investigate the determinants of capital flight using 30 sub-Saharan African countries, 24 of which were classified as severely indebted low-income countries for the period 1970-1996. Their empirical findings show that to a large extent capital flight shows a significant positive relationship with external borrowings in the Sub-Saharan region. Their estimates show that for every dollar that a country received 80% of it flowed back as capital in the same year. Their study also finds that the presence of capital flight showed a likelihood of an increase in capital flight in the future. Another empirical finding was that the growth rate differentials between an African Country and its OECD trading partners was negatively related to capital flight. Their paper includes a discussion on other factors that could explain capital flight which include fiscal policy indications, inflation, the political situation and the governance of the particular country.

Makocheanwa (2007) investigates the causes of capital flight from Zimbabwe between 1980 and 2005. The findings show that external debt, foreign direct investment inflows foreign reserves to be the major causes of capital flight of capital

flight. Economic growth is found to have a negative correlation with capital flight. He estimates capital flight in Zimbabwe to be in the region of \$10.1 Billion dollars. This means that for every US dollar of GDP accumulated annually from 1980 to 2005, Private Zimbabwean Residents accumulated (US) 5.4 cents of external assets annually during the same period.

Ellyne & Mbewe (2015) study the role of exchange rates on capital flight using South Africa, Zambia and Nigeria as a case Study for the period 1970 to 2010. The Granger causality test is used to determine causality, The Johansen Cointegration test is employed to determine whether a long run relationship exists and finally a Vector Error Correction Model (VECM) to establish the short run dynamics between capital flight and the real exchange rates. Their main finding was that in the larger economies of Nigeria and South Africa, the expectation of currency depreciation was a driver for capital flight. In Zambia however the opposite is true as the expectation of an appreciation in currency is the driver of capital flight. Macro-economic errors such as the unpredictability of inflation and foreign direct investment have an influence. Last but no least political factors are also found to have a contributory factor in all three countries.

Vukenkeng & Mukete (2016) investigate the relationship between capital flight and economic development using Cameroon as a case study. The observation period is 1970 to 2013 in order to evaluate capital flight in pre-debt crisis which was characterised by heavy borrowing and also during the debt relief. The technique of choice for calculating capital flight was the residual method. Their model of choice was the Fully Modified Least Squares technique which showed that capital flight had a significant negative relationship with economic development in Cameroon over their observation period. Explanatory variables such as exports and external debt also exhibited a negative relationship with economic development. The other explanatory variable which was the real interest rate was observed to have a positive relationship with economic development.

In his contribution on capital flight Ndiaye (2014) studies the impact of capital flight on economic growth in the Franc Zone. His observation period was for the period 1970 to 2010 where he uses the residual and the Morgan Guaranty Method as a measurement technique for capital flight. Capital flight was estimated to be in the

region of US\$86.8 billion with the Residual method and US\$80.1 billion with the Morgan Guaranty Method. This meant that capital flight represented 122.1% or 112.6% of GDP and was 5.3 or 4.9 times the amount of domestic investment. His econometric model shows capital flight to have a negative impact on economic growth in the Franc Zone. Capital flight was found to have reduced economic growth significantly and was thus a huge threat to the growth trajectory of these countries. His results show that domestic investment, credit provided to the private sector, the quality of regulatory institutions and domestic savings were important factors in explaining the extent of capital flight's influence on economic growth. These were seen as the important channels that affected the growth effect of capital flight in this zone. His view is that if capital flight was combated, there would be a significant increase in investment, credit to the private sector, the quality of the institutions, and domestic savings. His final recommendation is therefore that Combating capital flight in the Franc Zone would result in sustainable increases in economic growth for these countries.

Almounsor (2005) Studies the impact of capital flight on economic growth and development in the Middle East and North Africa by using the residual approach as a measurement technique. He relates the capital flight of each country based on the model of development that each country chooses. He finds that countries that are based on resource industrialization showed a larger amount of capital flight which was USD \$273 billion with the accumulated interest earning on capital flight being more than USD \$935 billion. In countries situated in the MENA with state led development and more balanced economics capital flight was estimated to be in the region of \$102 and \$112 billion. Capital flight in the resource based industrialisation is driven by natural resource exporting rents, the capitalist system of economic and the monarchical characteristics of their political system. In the state-led development economics capital flight is driven by large quantities of trade misinvoicing which is assisted by the introspective strategies.

Khant (1998) Examines how FDI inflows impact or drive capital flight and whether capital flight could be driven by an unfavourable investment climate or a discriminatory treatment towards the resident's investment. His study is based on a selection of East Asian countries, namely China, Korea, Malaysia, and Thailand. The other section of

the study is based on Latin American countries namely Argentina, Chile, Costa Rica, Jamaica, Mexico and Paraguay. The last section of the study is on countries in North Africa and Europe, namely Malta, Morocco, Portugal and Turkey. He finds that foreign direct investment facilitated capital flight in all the countries except for China which could be because of the complex web of relationships between often related business enterprises located in the coastal region of China and in Hong Kong and Taiwan. He finds that in using different measures of capital flight different results are obtained and thus shows the important effect of how one conceptualises the term.

Olugbenga & Alamu (2013) present a critical examination of capital flight on economic growth in Nigeria from 1981 to 2010. They use the residual Method to quantify capital flight and by employing the Johansen Co-integration Test they are able to determine that a long run relationship between economic growth and capital flight does exist. It was discovered that the expectation for capital flight to have a negative impact on economic growth only holds in the short run. In the long run capital flight showed to have a positive effect on the economic growth of Nigeria. The attribute this positive relationship in the long run due to the fact that the flows of capital flight returned to Nigeria through the purchases of industrial goods which transformed into economic growth. This therefore created a need to enable a friendly business environment in order to encourage foreign investors to invest in the country.

In a study based on Kenya Gachoki & Nyang'oro (2016) investigate the impact of capital flight on private investment in Kenya. To investigate this relationship, the two use an OLS regression analysis and their study finds that capital flight has an adverse impact on investment in Kenya. Their study also found that external debt, changes in the terms of trade, private to GDP ratio and real interest rates also have an impact on private investment

2.6 SUMMARY

This chapter presented literature that was relevant to the research study. The theoretical framework on economic growth was discussed, highlighting how the different schools of thought have classified what economic growth involves and also outlined the different theories on investment. A more thorough discussion on the

conceptualisation of capital flight and the factors that are perceived to determine capital flight was laid out to gain a holistic view on the concept. The chapter goes further by reviewing the different methods of measurement that are found in literature that demonstrate different ways on how to account for capital flight. Finally, the empirically literature was documented to show how far literature has gone on the subject.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter three provides an outline of the research methodology by discussing the data and how it was sourced, the model specification, estimation techniques, diagnostic and stability test.

3.2 DATA

The study uses secondary time series data of South Africa from the year 1986 to 2016. This period is chosen because of the limited nature of the data. The data used in this study is obtained from Quantec, Easy data, the South African Reserve Bank and the World Bank.

3.3 MODEL SPECIFICATION

A critical component of growth according to the neoclassical growth model is the amount of capital that is invested into the economy. Growth is seen as a Cob Douglas production function of capital and labour inputs (Thrilwal, 2013). This therefore means that to facilitate growth a certain amount of capital formation needs to be available. The accelerator theory of investment as discussed in the previous chapter suggests that investment in a country will happen according to the amount of income. As the level of income or demand increases (in this case economic growth), an excess of demand is created and economic agents will gain an incentive from increasing the level of capital investment. The incite of these theories suggests that an injection of capital formation is required for a country to experience growth, as this growth happens an excess demand is created and firms are propelled to increase their level of capital investment even further.

The depreciation of capital which creates the need to replace old machinery is also seen to be a driver of capital investment. Tobin q's theory suggests firms also need to replace old stock according to the incentive of acquiring addition machinery compared

to the cost of keeping old machines. The impact of investment on growth is therefore expected to be positive. The effects of capital flight are however considered negative because according to Ndikumana (2015) capital flight depletes the savings of a country and therefore reduces the ability for the country to acquire more capital investment. Capital flight as mentioned earlier will be measured using the residual method shown by equation 2.8. To determine the impact of capital flight and investment on economic growth this study adopts and modifies the model by (Gachoki & Nyang'oro, 2016). The model is therefore presented as:

$$GDP = f(CPI, TOT, GFCF, KF) \quad 3.1$$

where

GDP	=	Gross domestic product
CPI	=	Inflation
TOT	=	Terms of trade
GFCF	=	Gross fixed capital formation
KF	=	Capital flight

The Linear equation for our model is presented as:

$$LGDP_t + \beta_0 + \beta_1 CPI_t + \beta_2 TOT_t + \beta_3 LGFCF_t + \beta_4 LKF_t + \varepsilon \quad 3.2$$

where L , denotes the logarithm of the variables, this creates a uniformed unit of measurement for our variables and allows us to robustly analyse our data, however CPI and TOT are not logged as the variables are already appreciated in percentage form. β is the intercept of the variable and t denotes the particular year of the variable.

3.4 ESTIMATION TECHNIQUES

Following the study by Ibrahiem (2015) the ARDL procedure includes the stationary or unit root testing, Bounds tests for Cointegration, Pairwise Granger-Causality test, diagnostic and stability analyses.

3.4.1 Stationarity

The stationarity of a stochastic process is one that has historically played a significant role in the analysis of time series (Wooldridge, 2015). A time Series is considered to be stationary if its probability distributions are constant over time (Verbeek, 2004). Explicitly this means a variable is said to be stationary if its mean and variance are constant over time and the value of the covariance between the time periods depends solely on the space concerning two time periods and not the actually period at which point the covariance is calculated (Gujarati & Porter, 2009). This implies that any collection of random variables that is taken in the sequence and then shifted ahead of h time periods should have probability distributions that are unchanged (Wooldridge, 2015). The wide arrays of terms that are found in literature to describe this stochastic process are weakly stationary, covariance stationary, second order stationary, wide sense or stochastic process. According to Studenmund (2011) the following conditions are necessary for a time series variable, X_t to be stationary:

- the mean of X_t is constant over time,
- the variance of X_t is constant over time, and
- the simple correlation coefficient between X_t and X_{t-k} depends on the lag of (k) but on no other variable (for all k).

If one or more of these conditions are violated than the variable X_t is considered to be nonstationary. A time series that is not stationary will therefore have a mean that varies over time and a time varying variance or both (Gujarati & Porter, 2009). It is important for a time series to have stationary variables because if variables are nonstationary than the variable becomes relevant for only that particular episode, which would make it impossible to generalise it to other periods (Gujarati & Porter, 2009). This therefore makes any result of nonstationary variables irrelevant when forecasting. Another problem that arises from time series analysis is that the regression results will be spurious because the correlation inflates R^2 and the t -scores which is an incorrect model specification (Studenmund, 2011).

The most common kind of nonstationary that is found in a literature is the random walk model (Gujarati,2014), which consists of the random walk without a drift and the

random walk with a drift (Brooks, 2014). Below are equations that encapsulate the two models.

3.4.1.1 Random Walk Without A drift

Let u_t be a white noise error term that has a 0 mean and variance σ^2 . The series Y_t is considered to be a random walk if:

$$Y_t = Y_{t-1} + u_t \tag{3.3}$$

where the value of the variable is Y_t , the Y_{t-1} shows the lagged value of the variable and where the white noise error term is u_t with zero mean and variance σ^2 . By successive substitution of equation 3.2 it can be shown that:

$$Y_t = Y_0 + \sum u_t \tag{3.4}$$

where Y_0 is the initial value of the variable, which therefore

$$E(Y_t) = E(Y_0) + E(\sum u_t) = Y_0 \tag{3.5}$$

Since expectation of each u_t is 0, by successive substitution it can be also proven that

$$\text{var}(Y_t) = t\sigma^2 \tag{3.6}$$

It is clear to see that the mean of Y is equal to its initial value which is constant but as t, which is the time period increases indefinitely the variance of Y also increases indefinitely. This indefinite increase of Y is therefore a violation of one of the conditions of stationarity that the variance is constant (Wooldridge, 2015). In summary the random walk model without a drift is a nonstationary process because although it's

mean is constant over time, the variance of the variable increases over time (Brooks, 2014).

3.4.1.2 Random Walk with a Drift

Now to put the Random Walk Model with a drift into perspective we rewrite equation 3.3 as:

$$Y_t = \delta + Y_{t-1} + u_t \quad 3.7$$

where δ (delta) is the intercept in the random walk model and is known as the drift parameter.

For the Random Walk Model with a drift, it can be shown that:

$$E(Y_t) = Y_0 + \delta t \quad 3.8$$

$$\text{var}(Y_t) = t\sigma^2 \quad 3.9$$

As shown above, for the random walk model with a drift, both its mean and the variance increase over time this is a violation of the condition of stationarity in time series analysis. Rewriting equation 3.6 as the first difference of a random walk with a drift as:

$$Y_t - Y_{t-1} = \Delta Y_t = \delta + u_t \quad 3.10$$

It is easy to prove that

$$E(\Delta Y_t) = \delta \quad 3.11$$

$$\text{var}(\Delta Y_t) = \sigma^2 \quad 3.12$$

$$\text{cov}(\Delta Y_t, \Delta Y_{t-s}) = E(u_t u_{t-s}) = 0 \quad 3.13$$

this is because u_t is the white noise error term. The impact of this is that although the RMW with a drift is a violation of a stationary time series, the first difference of it becomes a stationary process. Put differently RMW with a drift is an I(1) process, where as its first differences is an I(0) process (Wooldridge, 2015). The constant δ here acts like a linear trend because in each period the level of Y_t shifts on average by the amount of the drift parameter δ (Gujarati, 2014).

In literature the random walk model is a common example of what is known as a unit root process (Gujarati & Porter, 2009). The unit root process is explained further in the section below due to its prevalence in time series analysis.

3.4.1.3 Unit Root Stochastic Process

To understand the Unit Root stochastic process, we write the equation:

$$Y_t = pY_{t-1} + u_t \quad 3.14$$

where

$$-1 \leq p \leq 1 \quad 3.15$$

This model is a representation of the Markov first-order autoregressive model, If p is found to be equal to 1, than we have the case of a unit root problem, which in actual fact means that the variance of Y_t isn't stationary (Gujarati, 2014). If $|p| < 1$ than the series is considered to be stationary and if $|p| > 1$ than the series is considered to be explosive (Palma, 2016). The terms nonstationarity, random walk, unit root and stochastic trend can therefore be treated synonymously (Gujarati & Porter, 2009). In the case that a variable is nonstationary there are a set of remedies that can transform a variable into a state of stationarity. These remedies include transforming variables into difference stationary, trend stationary and broken trend stationary (Kočenda & Černý, 2015).

Even though the bounds test allows for a mixture of the order of integration of appropriate variables, the implementation of the unit root test in the ARDL procedure might still be necessary to ensure that none of the variables is integrated of order 2 (I(2)) or beyond (Rao, et al., 2010) and (Fosu & Magnus, 2006). Another reason is that in the presence of me (2) variables it might be difficult to interpret the values of F statistics (Pesaran et.al, 2001).

3.4.2 Unit Root test

This study will use ADF and the DF-GLS test to test our variables for stationarity. To understand these tests in their totality, the study begins by laying out the initial Dickey-Fuller test developed by Dickey & Fuller in 1979. The test which is one of the most prominent unit root tests in literature (Arltová & Fedorová, 2016) is based on the first-order autoregressive process by Box & Jenkins. It is presented as:

$$Y_t = \phi_1 Y_{t-1} + \varepsilon_t \quad t = 1, \dots, T \quad 3.16$$

where ϕ_1 denotes the autoregressive parameter and the ε_t denotes the white noise process (Arltová & Fedorová, 2016). In order to calculate the tests statistic for the Dickey-fuller test we deduct Y_{t-1} from both sides of equation 3.15:

$$\Delta Y_t = \beta Y_{t-1} + \varepsilon_t, \quad 3.17$$

where $\beta = \phi_1 - 1$. The test statistic is set up as:

$$t_{DF} = \frac{\hat{\phi}_1 - 1}{s_{\hat{\phi}_1}}, \quad 3.18$$

where $\hat{\phi}_1$ denotes the least squares estimate of ϕ_1 and $s_{\hat{\phi}_1}$ denotes the standard error estimates. The model in equation 3.15 can include a constant or a linear trend and be expressed as

$$Y_t = \beta_0 + \phi_1 Y_{t-1} + \varepsilon_t \quad 3.19$$

$$Y_t = \beta_0 + \beta_{1t} + \phi_1 Y_{t-1} + \varepsilon_t \quad 3.20$$

3.4.2.1 ADF test

From equation 3.20 the ADF test is introduced. Formulated by Dickey & Fuller, (1981) who transformed equation 3.16 as:

$$y_t = \phi_1 y_{t-1} + \sum_{i=1}^{p-1} y_i \Delta y_{t-i} + \varepsilon_t \quad 3.21$$

where the equation below is used to calculate the test statistic of the ADF test:

$$y_t = (\phi_1 - 1)y_{t-1} + \sum_{i=1}^{p-1} y_i \Delta y_{t-1} + \varepsilon_t \quad 3.22$$

A practical problem of this test is the choice of lags p because if p is too low there will be a case of autocorrelation and if p is too high the test will be higher. The next step is the same as the original Dickey-Fuller test where equation 3.21 is expanded by a constant or a linear trend. The tests which are based on the following equation are used:

$$y_t = d_t + \phi_1 y_{t-2} + \sum_{i=1}^{p-1} y_i \Delta y_{t-i} + \varepsilon_t \quad 3.23$$

The final step is applying the conventional Dickey-Fuller test on the transformed time series. The null hypothesis is set up as $H_0 : \phi_1 = 1$, which is that the process contains a unit root and is therefore non-stationary and the alternative hypothesis is set up as $H_1 : |\phi_1| < 1$ which is that the process does not include a unit root and is stationary (Arltová & Fedorová, 2016).

3.4.2.2 DF-GLS test

From this point forth the DF-GLS test can be introduced, where the constant in equation 3.18 is estimated based on the generalised least squares method (GLS) using the transformation:

$$\tilde{Y} = Y_1, \tilde{Y}_t = Y_t - pY_{t-1}, \quad t = 2, \dots, T, \quad 3.21$$

$$X_1 = 1, X_t = 1 - p, \quad t = 2, \dots, T, \quad 3.22$$

Where $p = 1 + \bar{c}/T$ and $\bar{c} = -7$, which is based on the equation:

$$\tilde{Y}_t = \beta_0 X_t + \varepsilon_t \quad 3.23$$

The parameter $\tilde{\beta}_0$ is subsequently estimated by the least squares method which is used to remove the constant from the time series Y_t :

$$\Delta Y_t^* = Y_t - \hat{\beta}_0 \quad 3.24$$

The final step involves calculating the Dickey-Fuller test statistic based on the transformed time series which is given by:

$$\Delta Y_t^* = \phi_1 Y_{t-1}^* + \sum_{i=1}^p Y_i \Delta Y_{t-1}^* + \varepsilon \quad 3.25$$

The trend in a model that has a linear trend is estimated by GLS. Transformation 3.20 is extended by $z_1 = 1, z_t = t - p(t-1)$, where $p = 1 + \bar{c}/T$, where $\bar{c} = 13.5$. The estimates of the parameters are calculated based on the equation:

$$\tilde{y}_t = \beta_0 X_t + \beta_1 z_t + \varepsilon_1 \quad 3.26$$

And the estimated parameters $\tilde{\beta}_0$ and $\tilde{\beta}_1$ are used to remove the trend from the time series Y_t .

$$Y_t^* = Y_t - (\hat{\beta}_0 + \hat{\beta}_1 t) \quad 3.27$$

The final step is applying the conventional Dickey-Fuller test on the transformed time series. The null hypothesis is set up as $H_0 : \phi_1 = 1$, which is that the process contains a unit root and is therefore non-stationary and the alternative hypothesis is set up as $H_1 : |\phi_1| < 1$ which is that the process does not include a unit root and is stationary (Arltová & Fedorová, 2016). The critical values of the DF-GLS test are found on the basis of simulation in Elliot, Rothenberg, & Stock (1996). The Dickey-Fuller generalized least squares (DF-GLS) unit root by Elliot, Rothenberg & Stock (1996) is regarded as the most efficient test for an autoregressive unit root. From the above literature it can be seen that Elliot, et al basically augmented the Dickey-Fuller test statistic by employing a detrending generalized least square approach before performing the initial dickey-fuller test (Guaita, 2016). This test will be performed as a confirmatory test because it is considered to be the best when analysing the stationarity for an ARDL model (Alimi, 2014).

3.5 ARDL Modelling approach to Cointegration

The Autoregressive Distributed Lag (ARDL) model developed by Pesaran, Shin & Smith (2001) includes a combination of the traditional autoregressive model and a regression with distributed lags over a set of other variables (Fabozzi, et al., 2006). It runs a regression of a variable over its past value (autoregressive) and past or present values of an independent variable(s) (distributed lag) (Baltagi, 2011). The economic relationship between variables using an ARDL model can be presented simply as:

$$Y_t = \alpha + \lambda Y_{t-1} + \beta_0 X_t + \beta_1 X_{t-1} + u_t \quad 3.28$$

where the dependent and independent variables Y_t and X_t are both lagged by one year presenting the values of the previous periods of the variables (Baltagi, 2011). Once the ARDL model is set up it can be tested if some restrictions can be imposed on this general model, e.g. the order of lags. The model in equation one can be inverted in its autoregressive form as:

$$Y_t = \alpha(1 + \lambda + \lambda^2 + \dots) + (1 + \lambda L + \lambda^2 L^2 + \dots)(\beta_0 X_t + \beta_1 X_{t-1} + u_t) \quad 3.29$$

this is provided $|\lambda| < 1$. The equation 3.29 estimates the effective change in X_t on future values of Y_t . It is a fact that $\frac{\partial Y_t}{\partial X_t} = \beta_0$ while $\frac{\partial Y_{t+1}}{\partial X_t} = \beta_1 + \lambda\beta_0$, etc. The immediate responses of this derivative are the short run effects while the long run effects are a summation of all the partial derivatives, this result in $\frac{(\beta_0 + \beta_1)}{(1 - \lambda)}$. Alternatively this can

be derived from equation 3.28 at the long-run static equilibrium (Y^*, X^*) where $Y_t = Y_{t-1} = Y^*$, $X_t = X_{t-1} = X^*$ and the disturbances are considered to be zero. To illustrate this let:

$$Y^* = \frac{\alpha}{1 - \lambda} + \frac{\beta_0 + \beta_1}{1 - \lambda} X^* \quad 3.30$$

by replacing Y_t with $Y_{t-1} + \Delta Y_t$ and X_t with $X_{t-1} + \Delta X_t$ in equation 3.28 the results are:

$$\Delta Y = \alpha + \beta_0 \Delta X_t - (1 - \lambda) Y_{t-1} + (\beta_0 + \beta_1) X_{t-1} + u \quad 3.31$$

Equation 3.31 can be rewritten as:

$$\Delta Y = \alpha + \beta_0 \Delta X_t - (1 - \lambda) \left[Y_{t-1} - \frac{\alpha}{1 - \lambda} - \frac{\beta_0 + \beta_1}{1 - \lambda} X_{t-1} \right] + u \quad 3.32$$

where the terms that are in the brackets in equation 3.30 are the long-run equilibrium parameters. This is the derivation of Y_{t-1} from the long-run equilibrium term that corresponds to X_{t-1} . Equation 3.31 is referred to as the Error Correction Model (ECM). From this foundation of an ARDL model Pesaran, et al (2001) extended this model further to include a bounds test for cointegration (Baltagi, 2011) which is able to explicitly take into account independent variables that are not necessarily cointegrated among themselves (Focardi & Fabozzi, 2004). This ARDL approach involves estimating the following Unrestricted Error Correction Model (UECM): The models in equation 6 and 7 takes into account a one-period lagged error correction term which does not have restricted error corrections.

$$\Delta Y_t = a_{0Y} + \sum_{i=1}^p b_{iY} \Delta Y_{t-i} + \sum_{i=1}^p c_{iY} \Delta X_{t-i} + \sigma_{1Y} \Delta Y_{t-1} + \sigma_{2Y} \Delta X_{t-1} + \varepsilon_{1t} \quad 3.33$$

$$\Delta X_t = a_{0X} + \sum_{i=1}^p b_{iX} \Delta X_{t-i} + \sum_{i=1}^p c_{iX} \Delta Y_{t-i} + \varphi_{1X} \Delta X_{t-1} + \varphi_{2X} \Delta Y_{t-1} + \varepsilon_{2t} \quad 3.34$$

where the difference operator, p represents the lag structure, Y_t and X_t are the underlying variables, and ε_{1t} , ε_{2t} are serially independent random errors with mean zero and finite covariance matrix.

According to Pesaran, et al., (2001), in Equation 3.32, where ΔY_t is the dependent variable, the null hypothesis is $H_0 : \sigma_{1Y} = \sigma_{2Y} = 0$. The implication is that there no long run equilibrium relationship, and the alternative hypothesis is $H_1 : \sigma_{1Y} \neq 0, \sigma_{2Y} \neq 0$. This same applies in Equation 3.33, where ΔX_t is the dependent variable, the null hypothesis is $H_0 : \varphi_{1Y} \neq 0, \varphi_{2Y} \neq 0$ which means there no long run equilibrium relationship, and the alternative hypothesis is $H_1 : \varphi_{1Y} \neq 0, \varphi_{2Y} \neq 0$. The study will test these hypotheses by means of the Wald test (*F*-statistic and *t*-test) to differentiate the long-run relationship between the concerned variables. The structural lags are established by using minimum selection criteria like Schwartz-Bayesian Criteria (SBC) and Akaike's information criteria (AIC). The models are estimated through OLS.

With the above information in mind the ARDL specification for our long run model is therefore estimated as:

$$\Delta LGDP = \beta_0 + \delta_1 (LGDP)_{t-1} + \delta (CPI)_{t-1} + \delta (TOT)_{t-1} + \delta (LGFCF)_{t-1} + \delta (LKF)_{t-1} + \varepsilon \quad 3.35$$

where Δ is the difference operator, LGDP is the dependent variable, CPI, TOT, LGFCF and LKF are the independent variables. ε is the error term and β_0 is the corresponding intercept of the variable. Once the long run model is established the next step requires the establishment of the error correction model which is presented as follows:

$$\Delta LGDP = \beta_0 + \sum_{i=1}^p \Delta(LGDP)_{t-i} + \sum_{i=1}^p \Delta(CPI)_{t-i} + \sum_{i=1}^p \Delta(TOT)_{t-i} + \sum_{i=1}^p \Delta(LGFCF)_{t-i} + \sum_{i=1}^p \Delta(LKF)_{t-i} + \alpha ECT_{t-1} + \varepsilon \quad 3.36$$

After conducting the ARDL bounds test procedure to establish cointegration and to estimate the long and short run equations, the Granger causality test will be engaged to determine the causal relationship amongst the variables. Based on (Groenewold & Tang, 2007)'s suggestion, Granger-causality tests are applicable regardless of the orders of integration of the underlying variables if it has been established that there exists a long-run equilibrium between the underlying series. Therefore, in the instance that the ARDL bounds tests indicate the existence of a long run equilibrium relationship; this study will employ the use of Granger causality tests.

3.6 DIAGNOSTIC TESTING

The model will be taken under the following diagnostic tests:

3.6.1 Serial correlation

Serial correlation (also referred to as autocorrelation) is the violation of the CLRM assumption that the random error components or the disturbances are identically and independently distributed (Mukherjee, et al., 2013). It can be defined as a correlation between members of observations ordered in time or space (Verbeek, 2004). In the case that it is ordered in space as would be the case with cross sectional data, the presence of autocorrelation is called spatial correlation (Mukherjee, et al., 2013). The CLRM assumes there is no existence of autocorrelation in the disturbances u_i , this is symbolically presented as:

$$E(u_i u_j) = 0 \quad i \neq j \quad 3.37$$

Simply placed this assumption means that the disturbance term relating to any observation is not related to or influenced by the disturbance term relating to any other observation, that is they are independently and identically distributed (Gujarati & Porter, 2010). Serial correlation is normally prevalent in time series data rather than

cross sectional data because of the natural sequence order that is taken through time. As the error term detects the influence of those explanatory variables that affect the dependent variables but are excluded in the model (Verbeek, 2004), the chronological ordering of time series data sometimes results in the errors in a specific period affecting the error in the subsequent (or other) time period(s) (Asteriou & Hall, 2007). This is called positive correlation (Verbeek, 2004). The presence of autocorrelation is presented symbolically as:

$$E(u_i u_j) \neq 0 \quad i \neq j \quad 3.38$$

In the case presented by the equation above a shock or effect accounted from an excluded variable will be accounted for in the error term and has an effect on the variables included in the model and this causes of autocorrelation (Verbeek, 2004).

There are various factors that can cause autocorrelation. One of the reasons of autocorrelation is the exclusion of variables which is a misspecification of a model in the form of omitted variables (Gujarati & Porter, 2009). If Y_t is related to $X_{2,t}$ and $X_{3,t}$ but we incorrectly exclude $X_{3,t}$ in our model. The effect of $X_{3,t}$ will be included in the error term u_t . If the variable $X_{3,t}$ depends on the lagged values, $X_{3,t-1}$, $X_{3,t-2}$ as is a common case in time series analysis. There will be an unavoidable correlation among the disturbances u_t and u_{t-1} , u_{t-2} so on. This is therefore the reason why the existence of excluded variables can lead to the problem of autocorrelation (Asteriou & Hall, 2007).

Another cause of autocorrelation is because of a misspecification of the model in the form of a wrong functional form (e.g. a linear-in-variable (LIV) model is fitted whereas a log-linear model should be fitted resulting in a systematic pattern) (Gujarati & Porter, 2010). Misspecification of a model that can lead to autocorrelation may also be a result of having a dependent variable connected to an independent variable with a quadratic relationship and we improperly assume and estimate a straight line (Asteriou & Hall, 2007). The error obtained from the straight line specification will depend on the explanatory variable from quadratic relationship and depending on the increasing or decreasing value of it there will be autocorrelation (Mukherjee, et al., 2013).

The manipulation of data as is the often the case with empirical analysis of time series may also be a cause of autocorrelation (Gujarati & Porter, 2009). In the case that raw data is massaged e.g. monthly data is calculated by dividing the amount of quarterly data by three, the smoothness as a result of the manipulation of the data will dampen the fluctuations which will lead to a systematic pattern in the error term and therefore creating a problem of autocorrelation (Gujarati & Porter, 2010).

3.6.1.1 First Order Autocorrelation

There are a variety of forms of autocorrelation and each one leads to a different structure for the error covariance matrix $V(\varepsilon)$ (Verbeek, 2004). The simplest and most common form of it is known as the first-order serial correlation (Asteriou & Hall, 2007). Consider the multiple regression model:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \dots + \beta_k X_{kt} + u_t \quad 3.39$$

Where the current observation of the error term u_t is a function of the lagged observation of the error term (u_{t-1}) i.e.:

$$u_t = pu_{t-1} + \varepsilon_t \quad 3.40$$

where p is the parameter showing the functional relationship among the observation of the error term (u_t) and ε_t is the new error term which is iid (identically independently distributed). The coefficient p is called the first-order autocorrelation coefficient and has values from -1 to 1 (or $|p| < 1$) in order to avoid explosive behaviour (Asteriou & Hall, 2007). The size of p will therefore determine the strength of serial correlation which can be differentiated in three cases:

- In the case that p is equal to zero than there is no serial correlation due to the fact that $u_t = \varepsilon_t$ and the error term is therefore an iid (Verbeek, 2004).
- If p is closer to 1, the value of the lagged error term (u_{t-1}) becomes more significant because it also determines the value of the current error term (u_t) and is therefore an indication of a positive correlation (Asteriou & Hall, 2007).

- If ρ approaches -1 the strength of the serial correlation will be high however has a negative serial correction (Asteriou & Hall, 2007).

3.6.1.2 Consequences of Serial correlation

- The OLS estimators of the $\hat{\beta}$'s are still unbiased and consistent because unbiased does not depend on the assumption of serial correlation which in this case is violated (Asteriou & Hall, 2007).
- Although the estimators may still be linear unbiased and normally distributed, the presence of serial correlation as is the case with heteroskedasticity renders the estimators inefficient which means they are no longer BLUE (Gujarati & Porter, 2009).
- The estimated variance of the regression coefficients becomes biased and inconsistent which therefore means hypothesis testing is compromised and is invalid because the R^2 is often overestimated and the t-statistic will tend to be higher than is (Asteriou & Hall, 2007).

3.6.2 Test for Serial correlation

3.6.2.1 The Durbin-Watson d statistic

The most widely known test for serial correlation in literature is the Durbin-Watson d statistic which was developed by Durbin and Watson (Gujarati & Porter, 2010). The test has two important assumptions. The assumptions are that we have the x_t s as a deterministic trend, which means all errors are independent of all explanatory variables and that x_t has an intercept term (Verbeek, 2004). It is presented as:

$$d = \frac{\sum_{t=2}^n (u_t - u_{t-1})^2}{\sum_{t=1}^n u_t^2} \quad 3.41$$

where u_t is the OLS residual. Simple straight forward algebra shows that DW and \hat{p} are closely related:

$$dw \approx 2(1 - \hat{p}) \tag{3.42}$$

The approximation sign is because of small differences in the observations over which summations are taken (Verbeek, 2004). A reason this relationship is not precise is because \hat{p} has $\sum_i^n 2\hat{u}_{i-1}$ in its denominator, while the DW statistics has the sum of squares of all OLS residuals in its denominator however even with its moderate sample size, the approximation is seldom far off and therefore the *DW* test and the *t* test based on \hat{p} are conceptually the identical (Wooldridge, 2015).

In order to calculate if there is autocorrelation using the Durbin-Watson d statistic we consider the model and estimate it using OLS e.g.:

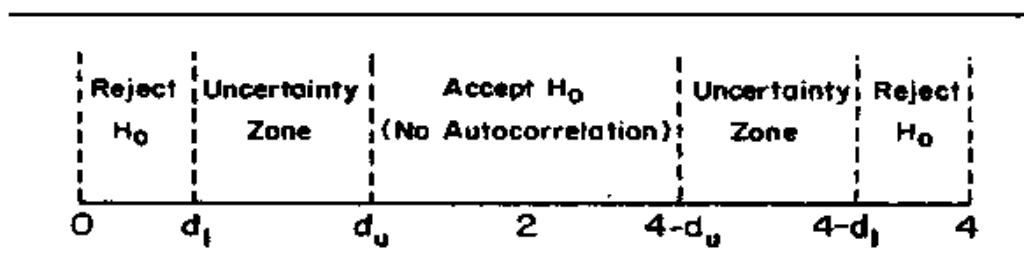
$$y_t = \beta_1 + \beta_2 X_{2t} + \beta_{3t} + \dots \beta_k X_{kt} + u_t \tag{3.43}$$

The next step would be to obtain the residuals where in the model above would be:

$$u_t = pu_{t-1} + \varepsilon_t \quad |p| < 1 \tag{3.44}$$

Once we have obtained the residuals the DW test statistic is given by the formula (Asteriou & Hall, 2007). After calculating the Durbin-Watson test one has to compute the upper (d_u) and lower limits (d_l) for the critical values because they cannot be tabulated for general use (Verbeek, 2004). The figure below is a guideline for detecting autocorrelation once the (d_u) and (d_l) are calculated and substituted

Figure 1: The DW test



Source: Asteriou & Hall(2007)

In order to test for positive serial correlation the hypotheses tests are set up as:

$$H_0 : \rho = 0 \text{ no autocorrelation}$$

$$H_1 : \rho > 0 \text{ positive correlation}$$

If the $d \leq d_L$ then the null hypothesis H_0 is rejected and there is positive autocorrelation, if $d \geq d_u$ the alternative hypothesis is not rejected and therefore there is no positive autocorrelation and in the special cases where $d_L < d < d_u$ then the test is rendered inconclusive (Asteriou & Hall, 2007).

In order to test for negative correlation the hypothesis tests are set up as:

$$H_0 : \rho = 0 \text{ no autocorrelation}$$

$$H_1 : \rho < 0 \text{ negative correlation}$$

If $d \geq 4 - d_l$ we reject the null hypothesis and accept that there is negative autocorrelation, if $d \leq 4 - d_u$ the alternative hypothesis is not rejected which therefore means that there is negative correlation and in the case that $4 - d_u < d < 4 - d_l$ then the test is inconclusive (Asteriou & Hall, 2007).

The inconclusive region of the DW test is due to the fact that the small sample distribution for the DW statistic depends on the X variable which makes it hard to determine, this is a major drawback of the Durbin-Watson test (Wooldridge, 2015). The Durbin-Watson is routinely supplied by most statistical packages with regression results which typically points out a quick indication of a potential presence of autocorrelation (Verbeek, 2004).

3.6.2.2 The Breusch-Godfrey LM Test for serial correlation

The DW test has a number of problems that might make it inappropriate to use in a variety of cases. This is because it may give inconclusive results, it is not appropriate when lagged dependent variables are used and it cannot detect high orders of autocorrelation (Asteriou & Hall, 2007). For this reasons the Breusch-Godfrey LM Test

for serial correlation provides an alternative procedure in asserting the presence or lack thereof autocorrelation. In order to run this test considers the model:

$$y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \dots + \beta_k X_{kt} + u_t \quad 3.45$$

where:

$$u_t = p_1 u_{t-1} + p_2 u_{t-2} + \dots + p_p u_{t-p} + \varepsilon_t \quad 3.46$$

The Breusch-Godfrey LM tests Combines the two equations:

$$y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + \dots + \beta_k X_{kt} + p_1 u_{t-1} + p_2 u_{t-2} + \dots + p_p u_{t-p} + \varepsilon_t \quad 3.47$$

the next step would be to set the null and the alternative hypothesis as:

$$H_0: p_1 = p_2 = \dots = p_p = 0 \quad \text{No autocorrelation}$$

$$H_1: p_1 = p_2 = \dots = p_p \neq 0 \quad \text{therefore there is autocorrelation}$$

After the hypothesis tests are set, the model is estimated by OLS and the \hat{u}_t are obtained we run the following regression model with the number of lags used (p) that are determined by the order of autocorrelation you are willing to test (Asteriou & Hall, 2007).

Once this is done we have to compute the LM statistic $= (n - p)R^2$ from the regression run to determine the order of order autocorrelation. If the LM statistic is greater than the χ_p^2 critical value which is given by the level of significance than the null hypothesis of serial correlation is rejected and serial correlation is present (Asteriou & Hall, 2007). It is important to note that the decision of p is uninformed however the periodicity of the data helps give a suggestion of its size (Wooldridge, 2015).

3.6.2 Heteroskedasticity

The classical linear regression model (CLRM) assumptions of econometric theory include a property of homoscedasticity, which practically means the variance of the

error term should be the same regardless of what the value of X is (Gujarati & Porter, 2009). Simply put in an equation this means:

$$\begin{aligned} \text{var}(u_i) &= E[u_i - E(u_i | X_i)]^2 \\ &= E(u_i^2 | X_i), \text{ Because of the zero mean value of} \\ &\hspace{15em} \text{disturbance } u_i \text{ OLS assumption} \\ &= E(u_i^2) \hspace{10em}, \text{ if } X_i \text{ are not stochastic} \\ &= \sigma^2 \hspace{15em} 3.48 \end{aligned}$$

The equation above demonstrates that the variance of the unobservable error term (u_i) which is conditional on X is constant (Wooldridge, 2015) If the CLRM assumption that the variance of the disturbance term on the conditional independent variables is identical for all combinations of outcomes of the independent variables is violated, then the model has a condition called Heteroskedasticity (Wooldridge, 2013). Heteroskedasticity can manifest itself in a variety of models that are virtually limitless and an analysis of all the alternatives would be an enormous task (Studenmund, 2011). However, a general linear regression model with the existence of Heteroskedasticity can be expressed in an equation as follows:

$$y_i = \beta_0 + \beta_1 x_i + u_i \hspace{15em} 4.49$$

$$\text{Var}(u_i) = E(u_i^2) = \sigma_i^2 \hspace{10em} \text{for } i=1, 2, \dots, n \hspace{5em} 3.50$$

It is important to note that there is a i subscript attached to the error term. This shows that the variance of the error is dependent on the particular value of x_i . Writing the OLS estimator as:

$$\hat{\beta} = \beta_1 + \frac{\sum_{i=1}^n (x_i - \bar{x})u_i}{\sum_{i=1}^n (x_i - \bar{x})^2} \hspace{15em} 3.51$$

By holding the first four CLRM assumption and disregarding that of homoscedasticity which would be done by letting $\text{Var}(u_i) = E(u_i^2) = \sigma_i^2$ and reverting to the two variable model as:

$$y_i = \beta_0 + \beta_1 x_i + u_i \quad 3.52$$

If we applied the usual formula, the OLS estimator for β_1 is:

$$Var(\beta_1) = \frac{\sum_{i=1}^n (x_i - \bar{x})^2 \sigma_i^2}{SST_x^2} \quad 3.53$$

Where $SST_x = \sum_{i=1}^n (x_i - \bar{x})^2$ is the total some of squares of x_i , when $\sigma_i^2 = \sigma^2$ for all i . In

this formula the usual form is reduced to $\sigma^2 SST_x$. The equation above clearly shows that for a simple regression case, the formula that is used under homoscedasticity is clearly different (Wooldridge, 2015). This does not however mean that β_1 is no longer a linear unbiased estimator, in fact if we replaced the assumption of homoscedasticity with the assumption of heteroskedasticity it would still be simple to prove that β_1 is still linear and unbiased (Gujarati & Porter, 2009). The presence of heteroskedasticity does however present some consequences for OLS estimations. When the error term u_i is heteroskedasticity, the implications for the OLS estimators are:

The presence of heteroskedasticity has an effect on the variance and therefore the standard error of the estimated $\hat{\beta}$ (as shown in equation 5), this means the variances including the standard errors are underestimated leading to a higher than anticipated t -statistics and F-statistics (Asteriou & Hall, 2015). In simple terms hypothesis tests become invalid because under the Gauss-Markov assumptions the presence of heteroskedasticity renders them invalid (Gujarati & Porter, 2009). Put in perspective skewness is the absence of symmetry in a frequency distribution, it can either be positive, negative or undefined and kurtosis measures the peak of the distribution and is either taller or shorter than a normal curve (Wooldridge, 2013). The normal distribution implies that $E(u_i^3) = 0$ and $E(u_i^4 - 3\sigma^4) = 0$ (Verbeek, 2004). If $E(u_i^3) \neq 0$ than the distribution cannot be considered to be symmetric around zero signalling skewness and if $E(u_i^4 - 3\sigma^4) > 0$ than the distribution is said to display excess kurtosis, meaning that the tails are fatter than that of a normal distribution (Verbeek,

2004). The heteroskedasticity test will be conducted using the Breusch-Pagan Godfrey, Harvey, Glejser, ARCH and White test.

3.6.3 Normality Test

The Jarque-Bera test is conducted in order to ensure that the model has the condition of normality. Developed by Jarque and Bera in 1980 it is a common and popular test for normality in economic literature (Verbeek, 2004); the null hypothesis is set up as the residuals are normally distributed and the alternative hypothesis is that the residuals are not normally distributed.

The test is in a formula presented as:

$$JB = \frac{n}{6} \left[s^2 + \frac{(k-3)^2}{4} \right] \quad 3.54$$

Where n is the sample size, S is the skewness and K represents the kurtosis. The test statistic asymptotically is distributed as χ^2 with two degrees of freedom (Baltagi, 2012).

3.7 STABILITY TESTING

The stability of the model will be tested by using the CUSUM and CUSUM of squares to check for structural breaks and the Ramsey RESET test to check for misspecification errors.

3.7.1 CUSUM and CUSUM of Squares

Indicator variables are used for structural stability in a regression function in which we specify a priori the location of the structural breakpoints, structural instability over cohorts of the sample need not to be confined to the shifts in the intercept of the relationship. A structural shift may not be present in the intercept, but it may be an important factor for one or more slope parameters, if there are doubts about the stability, a general model where all repressors are interacted with cohort indicators and test down where coefficients appear to be stable across cohorts (Baum, 2006)

Stability test will be conducted using the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUM of Squares). These tests will be conducted to test if the model is stable and if ever any structural break is evident within the observation period.

3.7.2 Misspecification Error Test

In the event that a multiple regression is found to suffer from a misspecification error, it means that the model does not adequately account for the relationship between the dependent and independent variables. An example of this would be if a quadratic term is omitted where we should have added one or instead of a log-log model we fit a level-level model (Wooldridge, 2015). The implication of this would be that the intercepts would be inconsistent and biased. The tests for misspecification will be conducted with the aid of the Ramsey RESET test. To understand the RESET test by ramset, consider the following auxiliary regression:

$$y = \beta_0 + \beta_1 + \beta_1 x_1 + \beta_2 x_2 + \dots \beta_k x_k + \delta_1 \hat{y}^2 + \delta_2 \hat{y}^3 + u \quad 3.55$$

The null hypothesis of the reset test is set up as:

$$H_o: \delta_1 = 0, \delta_2 = 0$$

In large samples and under the Gauss-Markov assumptions the F restrictions test follows the F (2, n-k-3) distribution. If the F statistic is greater than the critical value at a given significance level we can therefore reject the null hypothesis of a correct specification. This directs towards a misspecification error (Gujarati & Porter, 2010).

3.8 Granger Causality Analysis

Regression analysis involves a method for determining the functional relationships among variables. The relationship is shown by an equation or a model showing the response of a dependent variable and one or more independent variable. The response is shown as Y, which is the dependent variable and the set of predictor variables shown by $x_1, x_2 \dots x_n$ (Chatterje & Hadi, 2012). Regression analysis deals with the dependence of one variable on other variables, it does not however prove a causal relationship or a direction of influence exists, the granger causality test helps determine the causal direction of variables (Gujarati & Porter, 2008).

In line with Ibrahiem (2015), in the presence of a long run relationship amongst the variables the pairwise granger causality test is necessary indoor to examine the direction of influence from our variables. The Granger causality test procedure may therefore be presented as:

$$\Delta Y_t = \alpha + \sum_{i=1}^p a_i \Delta Y_{t-1} + \sum_{j=1}^q b_j \Delta X_{t-j} + \varepsilon_T \quad 3.56$$

$$\Delta X_t = \alpha + \sum_{i=1}^r c_i \Delta X_{t-1} + \sum_{j=1}^s b_j \Delta Y_{t-j} + \eta_t \quad 3.57$$

The Null hypothesis is set up here as ΔX Granger causes, Here, ΔX Granger causes ΔY , if the null hypothesis $H_0: b_1 = b_2 = \dots = b_q = 0$ is rejected against, the alternative hypothesis H_A : At least one $b_j \neq 0, j = 1, 2, 3, \dots, q$. And ΔY Granger causes ΔX , if $H_0: d_1 = d_2 = \dots = d_s = 0$ is rejected against the alternative hypothesis H_A : At least one $d_j \neq 0, j = 1, 2, 3, \dots, s$.

After applying the bounds testing approach to cointegration, stability and diagnostic tests the model will also be taken through the granger causality pairwise testing to the causal effects of the variables.

3.9 SUMMARY

The chapter provided a theoretical framework on all the empirical procedures that will be employed in order to robustly analyse and interpret the data with the sole goal of achieving the aim and objectives of the study. The theory on the necessary diagnostic and stability test employed in order to ensure that the procedures do not produce spurious results were also included.

The next chapter includes the application of all the tests and procedures that were outlined in this chapter

CHAPTER 4

INTERPRETATION OF FINDINGS

4.1 INTRODUCTION

This chapter is an application of all the econometric procedures that were presented in the previous methodology chapter. The first step was the computation of capital flight, followed by the unit root test and the ARDL bounds testing procedure. This chapter proceeds by presenting the diagnostic and stability tests to ensure that the model is not producing any spurious results. The granger causality test concludes the empirical analysis. Tests and procedures were all run through Econometric Views (Eviews) 9, which is an econometric statistical package.

4.2 CAPITAL FLIGHT CALCULATION

The calculations of capital flight are shown in Appendix A. This was done by using the changes in debt obtained from the South African Reserve Bank (SARB), foreign direct investment, current account balance and the changes in reserves which were all obtained from the World Bank. It is important to note that changes in debts are the authors own calculations as the SARB only supplies the actual amount of total foreign debt and not the changes.

4.3 UNIT ROOT TESTS RESULTS

In order to determine the level of integration of the variables, the standard ADF test and the DF-GLS test results are presented in tables 4.1 to 4.5.

Table 4.1 Augmented Dickey Fuller test (Intercept)

Variables	T-statistic	Critical Value	Order of integration	Conclusion
LGDP	-5.606778*	-3.670170	I(0)	Stationary
LTOT	-5.557374*	-3.670170	I(0)	Stationary
CPI	-6.286793*	-3.679322	I(1)	Stationary
LGFCF	-3.150385**	-2.967767	I(1)	Stationary
LKF	-3.189664	-2.963972	I(0)	Stationary

*denotes significance at 10%, ** denotes significance at 5% and ***denote significance at 1% level

Source: Author's Calculation

Table 4.2 Augmented Dickey Fuller test (Trend and Intercept)

Variables	T-statistic	Critical Value	Order of integration	Conclusion
LGDP	-4.561852*	-4.309824	I(1)	Stationary
LTOT	-5.572791*	-4.296729	I(0)	Stationary
CPI	-10.89575*	-4.309824	I(1)	Stationary
LGFCF	-3.284715***	-3.221728	I(1)	Stationary
LKF	-4.038719**	-3.568379	I(1)	Stationary

*denotes significance at 10%, ** denotes significance at 5% and ***denote significance at 1% level

Source: Author's Calculation

Table 4.3 Augmented Dickey Fuller test (None)

Variables	T-statistic	Critical Value	Order of integration	Conclusion
LGDP	-10.23434*	-1.953381	I(2)	Stationary
LTOT	-1.680335***	-1.610211	I(0)	Stationary
CPI	-2.391542**	-1.952473	I(0)	Stationary
LGFCF	-7.892138*	-2.650145	I(1)	Stationary
LKF	-2.630213	-1.952473	I(0)	Stationary

*denotes significance at 10%, ** denotes significance at 5% and ***denote significance at 1% level

Source: Author's Calculation

The results of the ADF test in table 4.1 where the test equation is run with an intercept show that all the variables are stationary. LGDP, LTOT and LKF are stationary at level while CPI and LGFCF become stationary only after first difference. The ADF test results in table 4.2 with a test equation that includes both the trend and intercept show that LTOT is stationary at level while LGDP, CPI, LGFCF, LKF are only stationary at the first difference. When the stationarity test is run without a trend or an intercept (at none), as shown in table 4.3. The results show LGDP to be stationary only after its second difference; LTOT, CPI and LKF are all stationary at level while LGFCF becomes stationary at its first difference.

Table 4.4 DF GLS test (intercept)

Variables	T-statistic	Critical Value	Order of integration	Conclusion
LGDP	-2.539356**	-1.952910	I(1)	Stationary
LTOT	-5.078463*	-1.952473	I(0)	Stationary
CPI	-4.895555*	-1.952910	I(1)	Stationary
LGFCF	-3.312523*	-2.647120	I(1)	Stationary
LKF	-2.729039*	-2.644302	I(0)	Stationary

*denotes significance at 10%, ** denotes significance at 5% and ***denote significance at 1% level

Source: Author's Calculation

Table 4.5 DF GLS test (intercept and Trend)

Variables	T-statistic	Critical Value	Order of integration	Conclusion
LGDP	-4.728770*	-3.770000	I(1)	Stationary
LTOT	-5.019946*	-3.770000	I(0)	Stationary
CPI	-5.824871*	-3.770000	I(1)	Stationary
LGFCF	-3.432384**	-3.190000	I(1)	Stationary
LKF	-4.145621	-3.770000	I(0)	Stationary

*denotes significance at 10%, ** denotes significance at 5% and ***denote significance at 1% level

Source: Author's Calculation

Tables 4.4 and 4.5 present the results of the DF-GLS test. These results are considered to be dependable as the test is considered to be the most reliable procedure when dealing with unit root for small sample sizes or for determining the order of integration when the ARDL model is used. Table 4.4 where the procedure is run with just an intercept reveals LGDP, CPI and LGFCF to be stationary only after the first difference, while the LTOT and LKF are stationary at level. The DF-GLS test is also run with a test equation that includes both the trend and intercept and the results are presented in table 4.5. The results show LGDP, CPI and LGFCF to be stationary after the first difference while LTOT and LKF are stationary at level.

The results of the unit root tests are that although when a regression test equation is run at none using the ADF test, all variables are stationary at I(0) and I(1) except for LGDP which shows signs of stationarity only after the second difference. The presence of I(2) variable means that the ARDL model cannot be run. However

according to Fatukasi, et al. (2015) in the case of a small sample size such as ours the test may be unreliable because in some cases it tends to over reject the null hypotheses when it is true and accept it when it is false Fatukasi, et al., (2015). As discussed in chapter three the most dependable test, the DF-GLS test shows that none of the variables are integrated in I(2). Which means that the combination of I(0) and I(1) variables allows us to continue with the analysis of an ARDL model since the stationarity criteria has been satisfied.

4.4 ARDL BOUNDS TESTING PROCEDURE

Tables 4.6, 4.7 and 4.8 present the results of the bounds testing approach and the full details of the results are presented in appendix C.

Table 4.6 Bounds Test.

Variables	F-statistic	Cointegration
F(LGDP/CPI,LTOT,LGFCF,LKF)	12.68924	Cointegrated

Source: Authors Calculations

Table 4.6 provides a summary of the results from the ARDL long run model.

Table 4.7 Critical Value Bounds (Pesaran)

Significance	Lower Bound	Upper Bound
1%	2.45	3.52
5%	2.86	4.01
10%	3.74	5.06

Source: Pesaran et.al. (2001)

Table 4.8 Critical Bounds (Narayan)

Significance	Lower Bound	Upper Bound
1%	4.32	5.78
5%	3.03	4.15
10%	2.51	3.51

Source: (Narayan, 2004)

There are 4 independent variables which therefore means that $k=4$. The appropriate lag structure was by the Eviews 9 statistical package using the AIC information criteria. With the use of table 4.7 provided by (Pesaran, et al., 2001) and table 4.8 provided by (Narayan, 2004) we obtain the upper bound and lower bound critical values necessary for bounds testing. The calculated F-statistic is 12.68924 which is greater than the upper bound at a 5% level of significance for both critical bounds. Narayan (2004) provides alternative critical bounds in the case that the sample size is more than 30 observations. We can thus conclude that there is evidence of a long-run relationship amongst our variables as means there is cointegration.

The study proceeded by estimating the long run cointegration equation and the coefficients of the model and the results are presented in Table 4.9.

Table 4.9 ARDL Long Run Model

Variable	Coefficient	P-Value
CPI _t	0.013642	0.3933
TOT _t	0.306615	0.0063
LGFCF _t	0.759242	0.0000
LKF _t	-0.016738	0.0028
C	19.300248	0.0000

Source: Authors Calculation

The results indicate that all variables except inflation have a significant influence on growth in the long term. LGFCF with a coefficient of 0.759242 indicates a positive relationship between capital investment and economic growth. The results of suggest that ceteris paribus a 1% increase in gross fixed capital formation would results in growth increasing by 76 % or a 1% decrease in capital formation would result in a 76 % decrease in growth. The results are in line with economic theory because ordinarily capital investment should exert a significant influence on economic growth. According to the Harrod-Domar model, capital formation is an important ingredient for growth. A sustainable level of capital investment should exist if a country is to experience sustainable growth. This is because an increase in a country's infrastructure means an improved production capacity and therefore a potential for an improved level of output.

As expected capital flight with a coefficient of -0.016738 exerts a negative influence on economic growth. The implication is that 1% increase in capital flight would result in a 1.7 % decrease in economic growth, while a 1 % decrease in capital flight would result in a 1.7 % increase in economic growth. Capital flight dampens growth because of the negative influence it has on important macroeconomic variables such as tax revenue and external debt (Ajayi, 1992). The negative impact of capital flight on growth is also consistent with (Ndiaye, 2014) (Vukenkeng & Mukete, 2016) (Makochekanwa, 2007) (Ifedayo & Olawale, 2015) (Salandy & Henry, 2013).

TOT is also found to have a positive relationship with economic growth with a coefficient of 0.306615 at 1%. This is also in line with economic theory because an increase in TOT to a level above 100% is an indication of capital accumulation while if the term of trade is less than a 100% more capital is going out of the country (Gachoki & Nyang'oro, 2016).

The next step of the ARDL model is to set up the short-run coefficients which include an error correction which will be able to indicate the speed of adjustment of the model. The results are presented in Table 4.10 and the full output is in Appendix C.

Table 4.10 ARDL Error Correction Model

Variable	Coefficient	t-statistic	Probability value
LGDP _{t-1}	-0.513008	-3.897371	0.0018
Δ CPI _t	0.005463	3.715225	0.0026
Δ TOT _t	0.022168	5.591099	0.0001
Δ LGFCF _t	0.209210	4.894067	0.0003
Δ LKF _t	-0.001346	-4.036262	0.0014
Δ ECT	-0.128306	-0.128306	0.0046

*denotes significance at 10%, ** denotes significance at 5% and ***denote significance at 1% level
Source: Author's Calculation

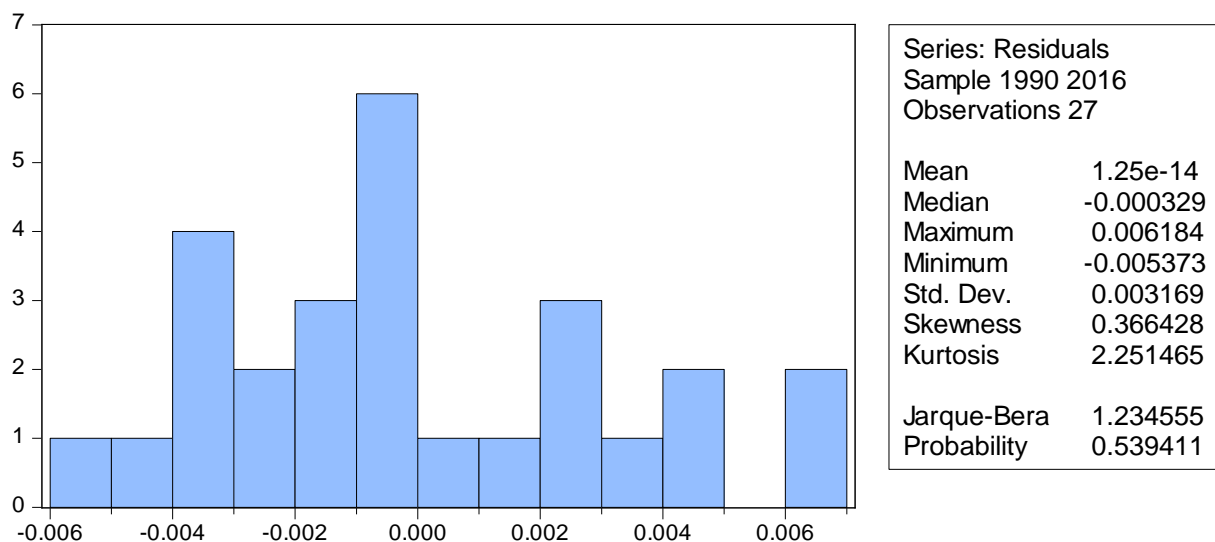
The error correction term (ECT) measures the speed of adjustment to equilibrium. The coefficient is significant and negative at a 1% percent level of significance which indicates that the disequilibrium caused by the previous year's shock will correct itself at a level of 13% to return back to the long-run equilibrium in the current year.

All the other coefficients of the variables are statistically significant at a 1 %. Although significant, inflation and capital flight with a coefficient of 0.005 and -0.001 seems to exert a diminutive influence on economic growth in the short term. However, it is the terms of trade and investment that seem to exert a significant influence on economic growth. The terms of trade with a coefficient of 0.022 is positive showing that a 1 % increase in the variable will result in a 22% increase in economic growth while a 1% decrease in the terms of trade would result in a decrease of economic growth. An increase in investment by 1% would lead to a 21% increase in economic growth and a decrease in investment by 1% would results in a decrease in economic growth by 21%.

4.5 DIAGNOSTIC TEST RESULTS

The next section includes the diagnostic tests which should confirm that the results from the ARDL model are not spurious by nature. The results are presented in Figure 4.1 and Tables 4.11 to 4.13.

Figure 4.1 Normality test



Source: Authors Calculations

Since the probability value is greater than the Level of significance at 5%, we do not reject H_0 and conclude that the residuals are normally distributed.

Table 4.11 Autocorrelation Test

Test	Null Hypothesis	Test Statistic	Probability Value
Ljung-Box Q	No autocorrelation	11.147	0.516
Lagrange Multiplier Test	No serial correlation	2.676567	0.2623

Source: Authors Calculations

The Ljung-Box Q and the Lagrange Multiplier tests are run to check if the model does not suffer from any form of serial correlation (autocorrelation). The null hypothesis is set up as there is no serial correlation and the alternative hypothesis is that there model has serial correlation. Since the probability value is greater than the Level of significance at 5%, we do not reject H_0 and conclude that there is no serial correlation (autocorrelation).

Table 4.12 Heteroskedasticity Test

Test	Null Hypothesis	t-Statistic	Probability Value
Breusch-Pagan Godfrey	No Heteroskedasticity	6.833510	0.9409
Harvey	No Heteroskedasticity	11.40582	0.6539
Glejser	No Heteroskedasticity	5.857910	0.9699
Arch	No heteroskedasticity	1.047768	0.3060
White	No heteroskedasticity	9.805670	0.7762

Source: Authors Calculations

The heteroskedasticity test where conducted by using the Breusch-Pagan Godfrey, Harvey, Glejser, Arch and White test. The null hypothesis is set up as there is no serial correlation and the alternative hypothesis is that their model is homoskedastic. Since the probability value is greater than the Level of significance at 5%, do not reject the null hypothesis and conclude that there is heteroskedasticity.

4.6 STABILITY TESTS RESULTS

Once the study has examined the diagnostic tests, the next step is to determine if the long-run and short-run parameters of our equation are stable and if there is any misspecification error. For this as explained in chapter 3 the Ramsey RESET test, cumulative sum (CUSUM) and Cumulative sum of squares will be used. The same procedures have been utilised by (Alimi, 2014) and (Fosu & Magnus, 2006) as a way of determining if the parameters of an ARDL model are stable. The results are presented in Figures 4.2, 4.3 and Table 4.14.

Figure 4.2 CUSUM

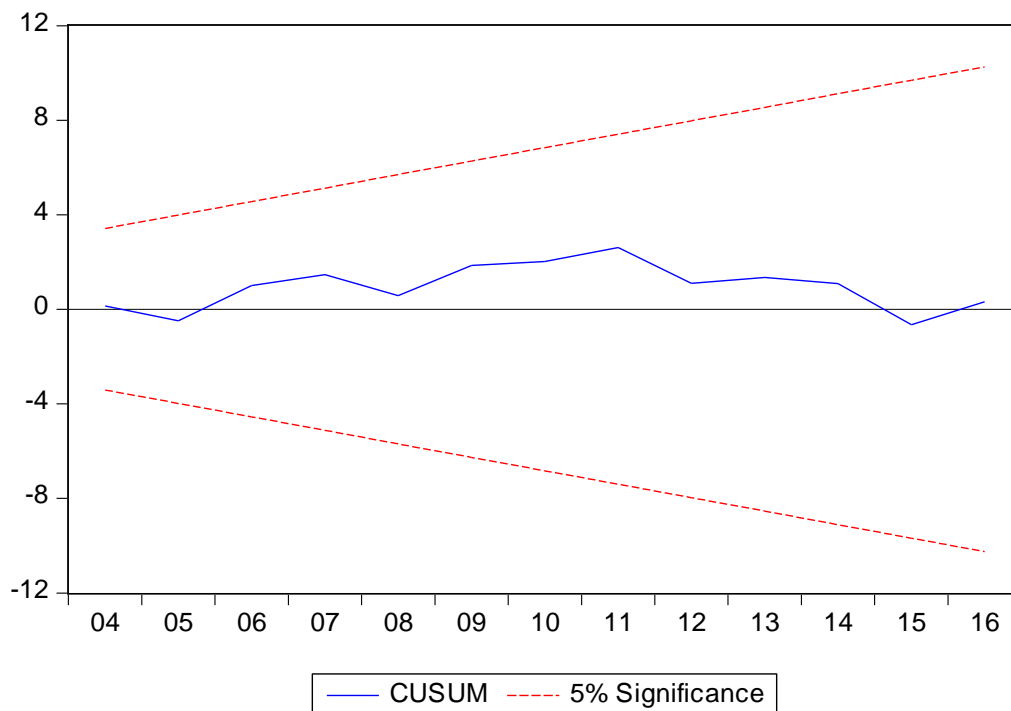


Figure 4.2 CUSUM of Squares

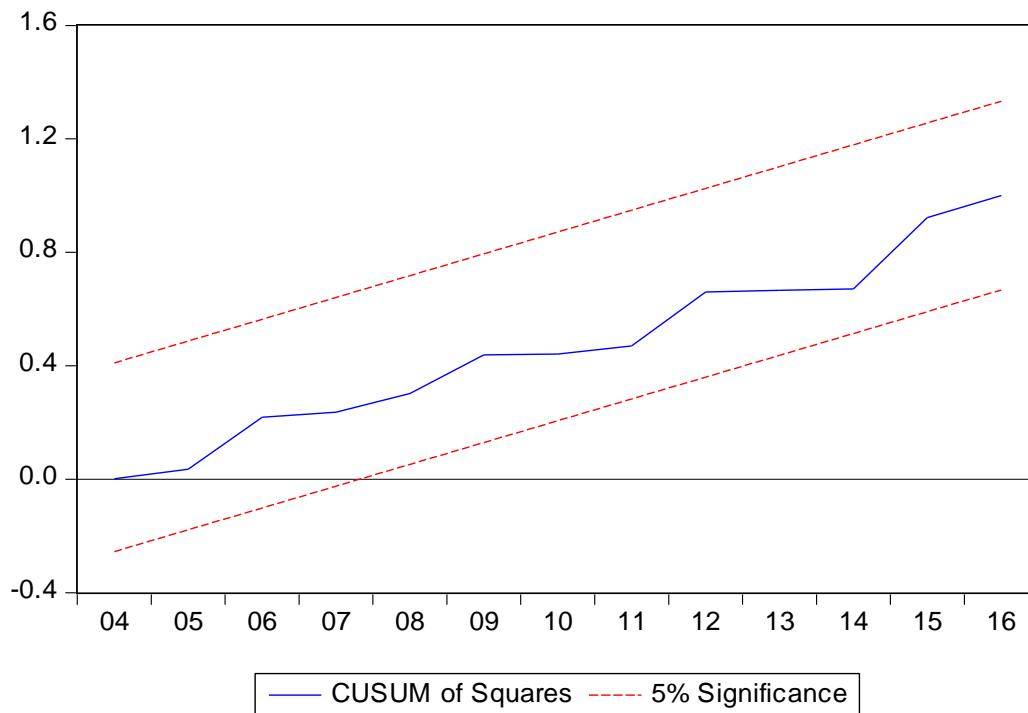


Figure 4.1 and Figure 4.2 plots the CUSUM and CUSUM of Squares. The results confirm that the long run parameters are stable because they stay within the critical bounds of 5% throughout the whole period of observation.

Ramsey RESET test results in Table 4.13 confirm that the model does not suffer from any misspecification error.

Table 4.13 Ramsey RESET Results

Test	Null Hypothesis	Test Static	P-Value	Conclusion
Ramsey Reset	The Model is correctly specified	0.750981	0.4671	Do not reject the Null hypothesis because the P-value is greater than the level of significance at 5%

Source: Authors Calculations

The full details of the test are provided in appendix L. The null hypothesis, that the model is correctly specified cannot be rejected because the p-value of 0.4671 is

greater than the 5% level of significance. It can therefore be concluding that this model has been correctly specified.

4.7 GRANGER CAUSALITY RESULTS

The table 4.14 presents the results of the Pairwise Granger causality test in order to determine the causal relationship between our variables.

Table 4.14 Pairwise Granger Causality Tests

Null Hypothesis	F-statistic	Prob.
CPI Does not granger cause LGDP	4.23072	0.0267
LGDP Does not granger cause CPI	4.66245	0.0195
LGFCF Does not granger cause LGDP	0.33432	0.7191
LGDP Does not granger cause LGFCF	3.09413	0.0637
LKF Does not granger cause LGDP	0.20884	0.8130
LGDP Does not granger cause LKF	1.92825	0.1673
TOT Does not granger cause LGDP	4.67199	0.0193
LGDP Does not granger cause TOT	0.94401	0.4030
LGFCF Does not granger cause CPI	1.46251	0.2516
CPI Does not granger cause LGFCF	2.65308	0.0910
LKF Does not granger cause CPI	1.42563	0.2600
CPI Does not granger cause LKF	0.43135	0.6546
TOT Does not granger cause CPI	0.44560	0.6456
CPI Does not granger cause TOT	0.19952	0.8205
LKF Does not granger cause LGFCF	0.21077	0.8114
LGFCF Does not granger cause LKF	2.14304	0.1392
TOT Does not granger cause LGFCF	6.92188	0.0042
LGFCF Does not granger cause TOT	0.87731	0.4288
TOT Does not granger cause LKF	0.56637	0.5750
LKF Does not granger cause TOT	0.66610	0.5229

Source: Authors calculation

The results indicate that a bidirectional causal relationship exists between inflation and economic growth at a confidence interval of 95%. This is in line with theory because a

general increase in the aggregate demand of a country is consistent with rising price levels while a general decrease in the growth of a country is consistent with a decrease in the price level of a country. Capital investment seems to be influenced by the increase in economic growth as the probability values between the variables indicate a unidirectional relationship between our variables at a 90% confidence interval. Most importantly this is in line with the accelerator theory that suggests that a rise in income is most likely going to result in an increase in capital formation.

The terms of trade in South Africa is also found to have a unidirectional relationship with economic growth and capital investment at a 95% confidence interval. This is also in line with theory because an improvement in the terms of trade should be translated into an increase in capital investment and therefore the growth of the country. Lastly it is observed that a unidirectional relationship between the inflation rate and capital investment also exists at a 90% confidence interval. All the other relationships between our variables seem to exert no causal influence on each other.

4.8 SUMMARY

The chapter presented the empirical findings of the study. Stationarity tests were conducted to determine the order of integration of the variables. The ARDL bounds procedure was also employed to determine the long and short run equation and Pairwise Granger causality test was also employed to determine the causal relationship amongst our variables. The chapter then proceeded by presenting the results of a series of diagnostic and stability tests. Normality and misspecification tests were also conducted. The next chapter presents a summary, recommendation and conclusion of the study.

CHAPTER 5

SUMMARY, RECOMMENDATIONS, CONCLUSION

5.1 INTRODUCTION

The following chapter concludes the study by providing a summary and interpretation of the findings. It proceeds by outlining the recommendation, the contributions and the limitations of the study.

5.2 KEY FINDINGS

The aim of this study was to determine the impact that capital flight and investment have on economic growth with the *a priori* expectation that investment would exert a positive influence while capital flight would exert a negative influence. The objectives were therefore identified as firstly determining volume of capital flight in South Africa; this was achieved by utilising the residual method. The next objective was determining the impact of capital flight on economic growth. The impact as expected was ascertained to be negative both in the long and short run. The influence however seemed to affect economic growth more in the long term. The objective after this this was to determine the impact of investment on economic growth. Investment was however unlike capital flight found to have a positive influence on economic growth both in the long and short run. Furthermore, the explanatory variables which were included in our model as control variables, namely the terms of trade and inflation also seem to exert a significantly positive influence on economic growth in the short and long run.

The next objective was to determine the causal relationship between our variables. The pairwise granger causality test was conducted in order to help in this regard. It was found that a bidirectional relationship between economic growth and inflation existed, economic growth was found to be an explanation for capital investment. This supported the accelerator theory because it proves that a generation of income is consistent with an accumulation of capital. The terms of trade were found to have a unidirectional relationship with economic growth and capital investment, asserting the

positive impact that an improvement in our international trade has on the growth trajectory of the country.

The study also conducted a series of stability and diagnostic test to ensure that our model is not giving us spurious results. The results cleared us of any violation of the CLRM properties and thus declaring our results robust enough to interpret.

5.3 POLICY RECOMMENDATIONS

Based on the results presented in Chapter 4, recommendations that could help in increasing the amount of capital investment in South Africa by decreasing the impact of capital flight are suggested. This would reduce its effects and thus stimulate economic growth in South Africa.

Policy measures should work in the direction of reducing capital flight. The recommendations with regards to capital flight in South Africa are proposed as follows:

5.3.1 Policy certainty, Macroeconomic and Political Stability

South Africa is a country that has a history of political instability, the introduction of democracy has undoubtedly to a great extent erased this. However, after two decades of a democratic state the country is perceived to have very serious policy dilemmas. The inability to deal with the unemployment and inequality rate from a macroeconomic point of view is to a great deal the most notable threat to the political and macroeconomic stability of the country. Countless policy measures have been implemented which have arguably been ineffective. There is therefore always the threat that as the inequality and unemployment rates increase, policy in South Africa will take a different direction. The existence of this policy uncertainty is seen in this study as a great driver of capital flight from South Africa. Efforts to adopt a policy (such as the NDP) and give clear directions when a change is made as to how and when it is to be implemented will surely go a long way in reducing the policy uncertainty that is driving international capital away from the country. It is therefore the recommendation of this study that political and policy decision should not be taken swiftly but rather go through a participation phase where a clear path as to what the

intention of a policy and political decision is and how a policy direction is expected to decrease the unemployment and inequality rates.

The continued presence of prudential macroeconomic management is also essential. External government debt should be managed effectively because in the event that it is not, a perception that we may be unable to pay off certain obligations would surely attract less international capital and send domestic capital abroad. This would compound on our need for capital as South Africa relies heavily on external capital. The fact that inflation is found to have a bidirectional relationship with economic growth is also seen as an indication of how macroeconomic stability is crucial to the health of the economy. The continuation of Inflation targeting is recommended. Inflation rates that are kept steady by ensuring that they are always within the target band of 3-6 % are a clear promotion of macroeconomic stability.

5.3.2 The introduction of efficient Capital control

The lifting of capital controls was indeed a step in the right direction because it liberated the financial system. It is however important to note that the surge in capital flight seems to suggest that some level of restriction in the flow of capital would be necessary. The responsibility is with government to ensure that there is a balance to controls which allow capital to move freely. The question for policy makers should be what level of freedom for capital movement is acceptable? The freedom to engage in transfer pricing and money laundering should without a doubt come with repercussions. The policies of tax havens with banks that promote the secrecy of funds are beyond the reach of local authorities. Emphasis on what can be done about local capital controls is therefore pivotal to ensuring less capital flight, especially the illegal side of it. Stringent laws on activities such as transfer pricing and money laundering should be implemented. Illegal activities of money laundering by individuals and transfer pricing from multinational corporations should be the serious target of law enforcement.

5.3.3 Attracting more capital domestically

There is no doubt that the liberation of the financial system has resulted in high volumes of capital movement. The ability for more capital to move inside the country also comes with the opportunity for it to move abroad. Policy makers should therefore be mindful of this by ensuring that more capital is being brought into the country rather than being sent abroad. Capital that is from abroad or that is generated domestically should be given a reason to stay within the borders of South Africa. The responsibility lies with policy makers to ensure that South Africa becomes a destination where capital generates high profit margins and is not at risk of loss due to hasty political decisions or perpetual policy uncertainty. An environment where risks of capital losses are managed and capital is given the opportunity to make substantial profits would allow more capital investments to happen.

Policies that reduce interest rates and increase the profits of investment through fiscal incentives, such as tax allowances and infrastructure projects would surely encourage capital inflows. This would increase the ability for government to raise more tax revenue. It would also be a step in the right direction towards addressing the socio-economic problems of the country.

The policy direction with regards to investment is that capital investment should be stimulated as the impact is found to be positive. Recommendations are proposed as follows:

5.3.4 Improvement in the terms of trade

The results of the terms of trade indicate a very clear path for policy makers. The fact that it is found to have a positive impact on economic growth while at the same time it is also a cause for capital investment and growth identifies its importance to the South African economy. It is therefore the recommendation that the policy direction in South Africa should be one where value is added to our exports so we can buy more import products. South African exports are characterised by a substantial portion of raw materials in the form of natural resources, the main component being gold. Policies that encourage industries which are involved in the exports of goods and services that

are value added is seen as a step in the right direction. Small businesses that are involved in the exports of goods that are manufactured rather than exported in just their raw form should be nurtured and be given the platform to grow. Introducing incentives and legislature for them to operate and grow is important. The higher our products move up the value chain the better our international trade standing will be. As our manufacturing industry grows more capital investment will happen and more capital will flow inside the country, the results would be an increase in the growth of the country.

5.3.5 Encouraging long term savings

Although savings were not a central feature of the study, the existence of them for the South African economy cannot be emphasised enough. Healthy saving rates can directly be related to the amount of capital investment in a country, they are also directly related to the degree of our dependence on foreign capital. A study by Mongale et al.(2013) found South Africa to have the lowest saving and consequently the lowest capital investment amongst its BRICS counterparts. China was observed to have the highest level of savings (which was 50% of GDP at the time) this coincided with it having the highest level of capital investment.

The effective implementation of policies directed at eradicating unemployment and inequality rates in South Africa would result in a greater pool of people earning a salary. This would result in them having an ability to contribute to the national saving rate. Government is also encouraged to implement policies that allow those with a sizeable disposable income to save more. Initiatives that promote citizens to save by giving them information on how to save effectively with a long term perspective could certainly kick off a chain of events that allow national savings to increase and contribute to the funding of domestic capital investment.

5.3.6 Responsible Borrowing

The existence of debt in a country that is trying to realise improved levels of capital investment will always be a reality. Debt is crucial in stimulating the economy in the event of shocks to the domestic economy. A good example of this is how the country was able to absorb the shocks of 2008 financial crisis through fiscal expenditure. The

important consideration to make when this debt is undertaken is that it should be within the boundaries of what the fiscus can handle. Once debt is perceived to be reckless, international capital will flee due to the fear that the country may be unable to settle its obligations. The inability of a country to pay off debt sets off a chain of events that send a country in economic turmoil, a good reference in this case may be Greece. The government is therefore recommended to always be engaging in the borrowing of funds for capital investments that are expected to help the country's long term vision. The responsibility of sound borrowing is also extended to the citizens of the country. The existence of large household debts is seen as an opportunity cost of higher saving rates. The government is encouraged to create programmes that inform the public of the implications of reckless borrowings and also increase the availability of debt counselors and financial advisors. This would ensure that debts owing are paid off and the contribution of households to the national saving rate is increased.

Policy certainty, Macroeconomic and political stability, the ability for South Africa to attract foreign capital and keep it domestically, efficient capital controls, improvements in the terms of trade, increased saving rates in South Africa and the sound borrowing for expansive infrastructure are seen as important policy considerations for South Africa. These according to our findings would decrease the amount of capital flight, increase the amount of capital investment and consequently lead to a higher level of economic growth.

5.4 CONTRIBUTIONS OF THE STUDY

To the best of this study's knowledge there hasn't been any study that has examined the impact of capital flight and investment on economic growth in South Africa. This study therefore contributes by adding this to the existing body of literature regarding the subject of capital flight and capital investment in an effort to foster growth and inform policy decisions.

5.5 LIMITATIONS OF THE STUDY

The elusive nature of defining capital flight and therefore consequently not assigning a universal measurement for it means that estimates regarding the actual amount of capital flight may differ. Although universal guidelines on how to measure it exist. The

fact remains that the adoption of alternative ways to measure capital flight means that one may come to different estimates regarding what the actual amount of capital flight is according to which method is adopted. The illegal component of capital flight also presents a challenge. This is because capital flight that manifests through activities such as transfer pricing and money laundering is hard to capture. The illegal components of capital flight are virtually almost impossible to quantify and as such their impact can barely be empirically studied. This component of capital flight is therefore a grey area of the study as the significance of these amounts could not be studied. The possibility that one may come to a different amount of capital flight according to one's definition and the illegal portion of capital flight that is not captured are therefore indeed the biggest limitations of this study.

The nature of our data also presented us with some limitations. Although the bounds testing procedure allows us to robustly analyse small data sets. The availability of data meant that we could only analyse the effects of capital flight from 1986 to 2016. This is however not a bombshell since it provides an opportunity for more work to be done because as the years go by the sample period will exist beyond our 31 observations and therefore print a better picture regarding the impact that capital flight has on the economic growth of South Africa. Different models that are able to handle large data sets would be adopted and therefore print a more assertive picture. The study also only dealt with the impact that capital flight and investment have on economic growth, further work may be done in it terms of what the impact of capital flight is on investment.

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APPENDICES

Appendix A: Calculation of Capital Flight

Year	Capital flight (In US\$ Millions)				
	Changes In Debt	Foreign Direct Investment	Current Account Balance	Changes In Reserves	Capital Flight
1986	-1128	121	2766	357	-4129
1987	25	304	5105	1209	-5985
1988	-1433	-94	2534	-1259	-2801
1989	4569	364	1498	-9	3444
1990	-2481	104	1552	388	-4317
1991	1645	-48	1399	604	-405
1992	1873	1936	1980	21	1807
1993	218	281	2803	-329	-1976
1994	2693	886	30	416	3134
1995	5639	1245	-2493	1169	8209
1996	-801	232	-1678	-2123	3231
1997	4690	-1487	-2227	3616	1814
1998	-1307	1084	-2199	-449	2425
1999	1241	81	-675	1989	8
2000	-2152	-692	-191	205	-2858
2001	-5951	-10785	343	-75	-17004
2002	2941	-1882	1009	190	-140
2003	5307	-231	-1542	337	6281
2004	5705	604	-6414	6732	5991
2005	3747	-5613	-8015	5738	412
2006	11611	5306	-12076	4969	24023
2007	16768	-3605	-16171	7326	22008
2008	-2208	-12005	-16411	1151	1047
2009	7961	-6313	-7907	5532	4022
2010	28363	-3855	-5492	4217	25784
2011	6924	-4293	-9319	4929	7021
2012	23611	-1727	-20315	1940	40259
2013	-5275	-1713	-21639	-980	15631
2014	8566	1900	-18683	-587	29736
2015	-20950	3994	-13911	-3235	189
2016	18701	1095	-9479	1293	27982

APPENDIX B: Unit Root

LGDP(ADF)

Null Hypothesis: LGDP has a unit root

Exogenous: Constant

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-5.606778	0.0001
Test critical values:		
1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*Mackinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000475
HAC corrected variance (Bartlett kernel)	0.000514

Null Hypothesis: D(LGDP) has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-4.561852	0.0056
Test critical values:		
1% level	-4.309824	
5% level	-3.574244	
10% level	-3.221728	

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

Residual variance (no correction)	0.000512
HAC corrected variance (Bartlett kernel)	0.000507

Null Hypothesis: D(LGDP,2) has a unit root
Exogenous: None
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-10.23434	0.0000
Test critical values:		
1% level	-2.650145	
5% level	-1.953381	
10% level	-1.609798	

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

Residual variance (no correction)	0.000769
HAC corrected variance (Bartlett kernel)	0.000361

LGDP (DF-GLS)

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-2.539356
Test critical values:	
1% level	-2.647120
5% level	-1.952910
10% level	-1.610011

*MacKinnon (1996)

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-4.728770
Test critical values:	
1% level	-3.770000
5% level	-3.190000

10% level

-2.890000

*Elliott-Rothenberg-Stock (1996, Table 1)

LTOT (ADF Test)

Null Hypothesis: LTOT has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-5.557374	0.0001
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

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

Null Hypothesis: LTOT has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-5.572791	0.0004
Test critical values: 1% level	-4.296729	
5% level	-3.568379	
10% level	-3.218382	

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

Null Hypothesis: LTOT has a unit root

Exogenous: None

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-1.680335	0.0873
Test critical values: 1% level	-2.644302	
5% level	-1.952473	
10% level	-1.610211	

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

LTOT (DF-GLS)

Null Hypothesis: LTOT has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Lothman-Stock DF-GLS test statistic	-5.078463
Test critical values: 1% level	-2.644302
5% level	-1.952473
10% level	-1.610211

*MacKinnon (1996)

Null Hypothesis: LTOT has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Lothman-Stock DF-GLS test statistic	-5.019946
Test critical values: 1% level	-3.770000
5% level	-3.190000
10% level	-2.890000

*Elliott-Lothman-Stock (1996, Table 1)

CPI (ADF TEST)

Null Hypothesis: D(CPI) has a unit root
 Exogenous: Constant
 Bandwidth: 28 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-6.286793	0.0000
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(CPI) has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 28 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-10.89575	0.0000
Test critical values: 1% level	-4.309824	
5% level	-3.574244	
10% level	-3.221728	

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

Null Hypothesis: CPI has a unit root
 Exogenous: None
 Bandwidth: 29 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-2.391542	0.0185
Test critical values: 1% level	-2.644302	
5% level	-1.952473	
10% level	-1.610211	

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

CPI (DF-GLS)

Null Hypothesis: D(CPI) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-4.895555
Test critical values: 1% level	-2.647120
5% level	-1.952910
10% level	-1.610011

Null Hypothesis: D(CPI) has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 3 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-5.824871
Test critical values: 1% level	-3.770000
5% level	-3.190000
10% level	-2.890000

*Elliott-Rothenberg-Stock (1996, Table 1)

LGFCF (ADF)

Null Hypothesis: D(LGFCF) has a unit root
 Exogenous: Constant
 Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-3.150385	0.0338
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

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

Null Hypothesis: D(LGFCF) has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-3.284715	0.0888
Test critical values: 1% level	-4.309824	
5% level	-3.574244	
10% level	-3.221728	

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

Null Hypothesis: D(LGFCF,2) has a unit root
 Exogenous: None
 Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-7.892138	0.0000
Test critical values: 1% level	-2.650145	
5% level	-1.953381	
10% level	-1.609798	

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

LGFCF (DF-GLS)

Null Hypothesis: D(LGFCF) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-3.312523
Test critical values: 1% level	-2.647120
5% level	-1.952910
10% level	-1.610011

Null Hypothesis: D(LGFCF) has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-3.587211
Test critical values: 1% level	-3.770000
5% level	-3.190000
10% level	-2.890000

LKF (ADF)

Null Hypothesis: LKF has a unit root
 Exogenous: Constant
 Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-3.189664	0.0306
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

Null Hypothesis: LKF has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-4.038719	0.0181
Test critical values: 1% level	-4.296729	
5% level	-3.568379	
10% level	-3.218382	

Null Hypothesis: LKF has a unit root
 Exogenous: None
 Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Augmented Dickey-Fuller test statistic	-2.630213	0.0104
Test critical values: 1% level	-2.644302	
5% level	-1.952473	
10% level	-1.610211	

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

Residual variance (no correction)	44.10432
HAC corrected variance (Bartlett kernel)	44.26039

LKF (DF-GLS)

Null Hypothesis: LKF has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-2.729039
Test critical values: 1% level	-2.644302
5% level	-1.952473
10% level	-1.610211

Null Hypothesis: LKF has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

	t-Statistic
Elliott-Rothenberg-Stock DF-GLS test statistic	-4.145621
Test critical values: 1% level	-3.770000
5% level	-3.190000
10% level	-2.890000

APPENDIX C ARDL Bounds Test

ARDL Bounds Test
 Date: 10/04/17 Time: 10:56
 Sample: 1989 2016
 Included observations: 28
 Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	15.83137	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

APPENDIX D ARDL Short and Long Run Model

ARDL Cointegrating And Long Run Form
 Dependent Variable: LGDP
 Selected Model: ARDL(1, 0, 3, 2, 2)
 Date: 10/04/17 Time: 10:57
 Sample: 1986 2016
 Included observations: 28

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LTOT)	0.014833	0.004550	3.260417	0.0053
D(CPI)	0.004424	0.001779	2.486209	0.0252
D(CPI(-1))	-0.004524	0.001541	-2.936222	0.0102
D(CPI(-2))	0.001519	0.000969	1.568432	0.1376
D(LGFCF)	0.206953	0.046813	4.420878	0.0005

D(LGFCF(-1))	-0.102846	0.044873	-2.291927	0.0368
D(LKF)	-0.001124	0.000391	-2.876060	0.0115
D(LKF(-1))	0.001418	0.000370	3.834031	0.0016
CointEq(-1)	-0.120731	0.045975	-2.626004	0.0191

$$\text{Cointeq} = \text{LGDP} - (0.1229 \cdot \text{LTOT} - 0.0094 \cdot \text{CPI} + 0.8116 \cdot \text{LGFCF} - 0.0135 \cdot \text{LKF} + 18.5763)$$

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LTOT	0.122862	0.071303	1.723104	0.1054
CPI	-0.009420	0.014667	-0.642250	0.5304
LGFCF	0.811591	0.043380	18.708716	0.0000
LKF	-0.013520	0.005731	-2.359305	0.0323
C	18.576255	0.654567	28.379473	0.0000

Appendix E Granger Causality Error Correction

Pairwise Granger Causality Tests

Date: 10/18/17 Time: 15:09

Sample: 1986 2016

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CPI does not Granger Cause LGDP	29	4.23072	0.0267
LGDP does not Granger Cause CPI		4.66245	0.0195
LGFCF does not Granger Cause LGDP	29	0.33432	0.7191
LGDP does not Granger Cause LGFCF		3.09413	0.0637
LKF does not Granger Cause LGDP	29	0.20884	0.8130
LGDP does not Granger Cause LKF		1.92825	0.1673
LTOT does not Granger Cause LGDP	29	4.67199	0.0193
LGDP does not Granger Cause LTOT		0.94401	0.4030
LGFCF does not Granger Cause CPI	29	1.46251	0.2516
CPI does not Granger Cause LGFCF		2.65308	0.0910
LKF does not Granger Cause CPI	29	1.42563	0.2600
CPI does not Granger Cause LKF		0.43135	0.6546
LTOT does not Granger Cause CPI	29	0.44560	0.6456
CPI does not Granger Cause LTOT		0.19952	0.8205
LKF does not Granger Cause LGFCF	29	0.21077	0.8114
LGFCF does not Granger Cause LKF		2.14304	0.1392
LTOT does not Granger Cause LGFCF	29	6.92188	0.0042
LGFCF does not Granger Cause LTOT		0.87731	0.4288

LTOT does not Granger Cause LKF	29	0.56637	0.5750
LKF does not Granger Cause LTOT		0.66610	0.5229

APPENDIX STABILITY AND DIAGNOSTIC Test

APPENDIX G Breusch-Godfrey Serial Correlation LM Test:

LM test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.299785	Prob. F(14,13)	0.9835
Obs*R-squared	6.833510	Prob. Chi-Square(14)	0.9409
Scaled explained SS	1.106863	Prob. Chi-Square(14)	1.0000

APPENDIX H Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Harvey

F-statistic	0.638242	Prob. F(14,13)	0.7924
Obs*R-squared	11.40582	Prob. Chi-Square(14)	0.6539
Scaled explained SS	39.16800	Prob. Chi-Square(14)	0.0003

APPENDIX I Heteroskedasticity Test: ARCH

Heteroskedasticity Test: ARCH

F-statistic	1.009324	Prob. F(1,25)	0.3247
Obs*R-squared	1.047768	Prob. Chi-Square(1)	0.3060

APPENDIX J Heteroskedasticity Test: White

Heteroskedasticity Test: White

F-statistic	0.500445	Prob. F(14,13)	0.8939
Obs*R-squared	9.805670	Prob. Chi-Square(14)	0.7762
Scaled explained SS	1.588281	Prob. Chi-Square(14)	1.0000

APPENDIX K Ljung-Box Q Test: Autocorrelation

Date: 10/07/17 Time: 15:20

Sample: 1986 2016

Included observations: 28

Q-statistic probabilities adjusted for 3 dynamic regressors

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*	
. * .	. * .	1	-0.183	-0.183	1.0405	0.308
. * .	. * .	2	-0.114	-0.153	1.4602	0.482
. .	. .	3	0.022	-0.032	1.4764	0.688
. * .	. * .	4	-0.140	-0.168	2.1594	0.706
. .	. * .	5	-0.047	-0.123	2.2411	0.815
. ** .	. *** .	6	-0.259	-0.377	4.8018	0.569
. **	. *	7	0.316	0.160	8.7982	0.267
. * .	. ** .	8	-0.128	-0.212	9.4872	0.303
. .	. .	9	0.001	-0.024	9.4872	0.394
. * .	. ** .	10	-0.070	-0.335	9.7146	0.466
. * .	. * .	11	-0.078	-0.177	10.013	0.529
. *	. * .	12	0.147	-0.165	11.147	0.516

APPENDIX L RAMSEY RESET TEST

Ramsey RESET Test

Equation: EQ03

Specification: LGDP LGDP(-1) LGDP(-2) LGDP(-3) CPI CPI(-1) CPI(-2)

LTOT LTOT(-1) LTOT(-2) LGFCF LGFCF(-1) LKF LKF(-1) LKF(-2) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.750981	12	0.4671
F-statistic	0.563973	(1, 12)	0.4671

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	3.82E-05	1	3.82E-05
Restricted SSR	0.000851	13	6.54E-05
Unrestricted SSR	0.000813	12	6.77E-05