ANALYSING THE RELATIONSHIP BETWEEN REAL EXCHANGE RATE

MISALIGNMENT AND CAPITAL FLOW IN NAMIBIA

A THESIS SUBMITTED IN PARTIAL FULFILMENT

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BY

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Abstract

The paper analysed the relationship between real exchange rate misalignment and capital flow in Namibia during the period 1993Q1 - 2015Q4. Namibia has a fixed exchange rate regime which is prone to speculative attack, moreover, a devaluation or undervaluation is the major cause of capital outflow which hinders economic growth. Thus, the estimation of the equilibrium RER and misalignment is essential. The study employed time-series techniques such as the unit root test, autoregressive distributed lag bound test to co-integration, error correction modelling approach, diagnostic and stability test. The inflexion point of misalignment was also used to find the effects of real exchange rate misalignment on capital flow in the country. The error correction model results showed amongst others that the terms of trade, inflation rate, interest rate differential and GDP are positively and insignificantly associated with capital flow. On the other hand, the real exchange rate misalignment had a negative and insignificant effect on capital flow. Many policy recommendations were drawn from the research findings. Firstly, policy makers could improve the exchange rate and the management of the REER misalignment thereby promoting the competitiveness of commodities. Secondly, the focus of policy reform could also be on creating a conducive investment atmosphere so as to entice foreign capital and encourage domestic investment. Moreover, restrictions could also be placed on capital outflow in an attempt to ease the effect on the exchange rate.

Table of Contents

Declaration

I, Isabel N. Nghinamupika, student number 201122049 declare that this thesis paper handed in at the University of Namibia in partial fulfillment of Master of Science (Economics) is my own original work, and that all sources I have used or quoted are acknowledged. I declare that I have not submitted a thesis paper that was done by any other student for this course or any other source. I have acknowledged all those that assisted me. I understand that any false claim for this study will be penalised in accordance with the University of Namibia regulation.

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Signature (Student)   Date

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Signature (Supervisor)   Date

Dedication

First and foremost, I would like to utter my heartfelt gratitude to the Almighty God for sparing, aspiring and carrying me through the whole challenging journey of my studies towards my Master's Degree; glory be to Him! Secondly, I am indebted to thank my wonderful mother, Miss Hilia Shuudeni, who would give anything up for my wellbeing and I specifically want to thank her for her encouragements, infinite effort and financial support towards accomplishing this endeavour.

A year of appreciation to my very own little twin brothers, Stephanus and Knowledge Shuudeni, for giving me purpose and motive to work hard.

Finally, my family, classmates and friends who encouraged me to keep up with this original idea, many thanks for their valuable inputs where I asked for their opinions with regards to this project.

Acknowledgement

Firstly, I would like to express my appreciation to Professor Johannes Peyavali Sheefeni, my supervisor. I thank him for his support, guidance and technical input in coming up with this write up. God bless you abundantly!

Lastly, I am indebted to express my heartfelt thanksgiving to the DAAD funding scheme for their financial support. It is my sincere prayer that God bless them abundantly so that they continue financially aiding other brilliant minds out there.

List of figures

List of tables

List of Acronyms

ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
CMA	Common Monetary Area
ERER	Equilibrium Real Exchange Rate
RER	Real Exchange Rate
REER	Real Effective Exchange Rate
FDI	Foreign Direct Investment
TOT	Terms of Trade
GDP	Gross Domestic Products
OPN	Trade Openness
CF	Capital Flow
INF	Inflation Rate
OLS	Ordinal Least Square
ID	Interest Rate Differential
PP	Phillips-Perron
REER	Real Effective Exchange Rate
GDP	Gross Domestic Products
MI	Misalignment

KPSS	Kwiatkowski Phillips-Schmidt-Shin
SACU	South African Custom Union
UECM	Unrestricted Error Correction Model
ECM	Error Correction Model
AIC	Akaike Information Criteria
VAR	Vector autoregressive

CHAPTER ONE: INTRODUCTION

1.1   Orientation of the study

An appropriate exchange rate regime is essential for economic stability and growth. Over the past decades, most developing countries have shifted from a fixed to a flexible exchange rate (Kubota, 2009). Namibia has maintained its fixed exchange rate to stabilise its currency against some anchor currencies and as the most effective strategy for combating high inflation. However, fixed exchange rate regimes are prone to speculative attack. Gouider and Nouira (2014) specifically argued that an overvaluation is a problem for most countries with fixed exchange rates since it leads to capital outflow as speculators anticipate that the currency will depreciate. An overvaluation is a deviation from equilibrium better known as real exchange rate (RER) misalignment. Thus, according to Gouider and Nouira (2014), misalignment can be defined as the deviation of the actual exchange rate from the equilibrium value; if the actual exchange rate is greater or more appreciated than the equilibrium value, the currency is considered to be overvalued. The equilibrium value or equilibrium real exchange rate (ERER) is defined as the relative price of tradable and non-tradable price which results in the simultaneous achievement of internal and external equilibrium (Edwards, 1989), whereas the real exchange rate is defined as the rate at which goods and services produced in one country can be exchanged for goods produced in another country (Musyoki, Pokhariyal and Pundo 2012).

According to Kubota (2009), the subject of RER misaligned is crucial in academic and policy circles because it may reflect distortions in relative prices attributed to unsound domestic policies, by signaling distortions in relative prices. Furthermore, RER misalignments characterisation would allow a better understanding of their causes and consequences so that policymakers could attempt to implement the required adjustments. Eita and Sichei (2014) state

that countries such as Namibia that have high shares of primary products in their exports; experienced the largest real exchange rate misalignments in response to shocks that affected primary products. Therefore, the estimation of the equilibrium RER and resulting misalignment is important. Moreover, the current account is likely to be affected by the real rather than nominal exchange rate.

Under a fixed exchange rate regime, an increase in the demand for goods and services as a result of money supply increases leads to inflation (or higher prices) and thus an appreciation of the RER (Combes, Kind and Plane, 2011). Furthermore, when the RER falls the domestic currency appreciates and a rise in RER implies domestic currency depreciation in real terms.

Although Namibia has been experiencing exchange rate volatility (depreciation or appreciation), an appreciating RER only becomes a problem when it shows that the real exchange rate is becoming overvalued. Furthermore, significant appreciation leads to capital outflow and destabilisation of macroeconomic management. Thus, the study sought to assess whether Namibia's currency appreciation is significant enough to cause an exchange rate misalignment.

1.2   Problem statement

There have been debates over the relationship between real exchange rate and capital flow. However, this relationship can best be explained by the balance of payments equation. In the case of Namibia, the Namibian dollar is pegged to the South African Rand, which has been depreciating over the past years. This has also affected the Namibian currency and most likely to have resulted in capital outflow. The implication is that capital outflow imposes a burden on countries in the form of reduction in economic growth and subsequently the standard of living (Eita and Jordaan, 2013). Mcleod (2002) and Vos (1992) found that fluctuations of the RER, such as a devaluation or undervaluation are the major cause of capital outflow which has

consequences on the growth and competitiveness of an economy. It is against this background that this study aimed to assert the relationship between real exchange rate misalignment and capital outflow in Namibia.

1.3 Objectives

The main objective of the study was to analyse the relationship between real exchange rate misalignment and capital flow in Namibia. The specific objectives were:

- To determine the presence of real exchange rate misalignment in Namibia during the period of 1993-2015.

- To examine whether the relationship between exchange rate misalignment and capital flow is of short or long-run in nature.

- To estimate a precise threshold value to examine when real exchange rate misalignment suppresses (significantly affects) capital inflows.

1.4 Hypothesis

$H_0 = 0$ There is no presence of real exchange rate misalignment in Namibia.

$H_1 \neq 0$ There is a presence of real exchange rate misalignment in Namibia.

$H_0 = 0$ There is no relationship between real exchange rate misalignment and capital flow.

$H_1 \neq 0$ There is a relationship between real exchange rate misalignment and capital flow.

$H_0 = 0$ Real exchange rate misalignment does not significantly affect capital inflows.

$H_1 \neq 0$ Real exchange rate misalignment significantly affects capital inflows.

1.5 Significance of the study

The impact of the real exchange rate misalignment on capital flow has not received adequate attention in Namibia. Therefore, the study contributes to the empirical literature, since there is a shortage of empirical studies on this issue. The RER misalignment has negative effects on economic growth and performance. Eita and Jordaan (2013) further stated that countries such as Namibia whose exports comprises mainly of primary products, experienced the largest RER misalignment. In addition, Namibia has been experiencing slow economic growth. It is hoped that this study might contribute to the Namibian economy given that it analyses if the slow growth could be attributed to the RER misalignment.

1.6 Limitation of the study

The study was limited to a number of variables used in explaining the relationship between real exchange rate misalignment and capital outflow, therefore, some important factors might have been omitted resulting in ambiguous results.

CHAPTER TWO: AN OVERVIEW OF NAMIBIA'S REAL EXCHANGE RATE AND CAPITAL FLOW

2.1   Introduction

The purpose of this chapter was to give an overview of the real exchange rate and capital flow in Namibia. The chapter was divided into nine sections. Section 2.2 presented a brief description of the real exchange rate and capital flow in Namibia. Section 2.3 provided an overview of Namibia's inflation rate, section 2.4 discussed the overview of the real exchange rate in Namibia, section 2.5 provided an overview of the capital flow in Namibia, section 2.6 presented an overview of the real exchange rate misalignment in Namibia, section 2.7 provided an overview of Namibia's economic growth and the last section 2.8 provided a brief overview of the interest rate differential.

2.2   Real exchange rate and capital flow

Namibia is a member of the Common Monetary Area (CMA) where exchange rates between the member states are fixed; there are no payment restrictions and capital flows are free. Consequently, under a fixed regime, a country cannot operate an independent monetary and interest rate policy, as it may disrupt the fixed arrangement through the capital account (Mabakeng and Sheefeni, 2014).

According to Alweendo (1999), the persistence of capital outflow is one of the major detriments of the present arrangement. In addition, market related net movements of capital tend to be in favour of South Africa. This is mainly due to the fact that South Africa has the most sophisticated financial markets within the CMA arrangement, implying that capital flows may be concentrated in that market. This could impede the growth of financial markets at the early stages of development in Namibia. Ndikumana (2003) argued that "private capital inflows to

most African economies are limited due to several factors, including the weakness of the macroeconomic environment, underdeveloped financial systems, high country risk, and exchange rate misalignments".

Moreover, Alweendo (1999) further stated that Namibian pension and portfolio funds are directed to South Africa, which implies a lack of investment funds for the economy and unequal economic and development potential. In addition, Ikhide and Uanguta (2010) identified that "the capital flows into and out of the CMA are dominated by flows from and out of South Africa. South Africa also accounted for close to 93.4% of the region's direct investment abroad, 99% of portfolio investment abroad and 86.5% of total foreign investment assets in the region. Almost, all portfolio investment by foreigners within the CMA area is directed to South Africa". However, capital mobility within the CMA has generated investment funds. Furthermore, a larger amount of foreign direct investment inflow has been coming from South Africa, which in part offsets capital outflow.

According to IMF (2005), Namibia has effectively imported South Africa's inflation targeting framework, which has helped reduce inflation from 11.25% in 2002 to an estimated 2.5% in 2005. Moreover, Namibia has also been subject to the fluctuations of the South African Rand. Furthermore, the Rand suffered periods of balance of payment pressure or currency crises in 1994, 1996, 1998 and 2001, therefore linking to the Rand may introduce shocks that could be avoided by floating or pegging to another currency. However, given that Namibia's trade is concentrated with South Africa, the impact of the Rand fluctuation versus other currencies has been muted. For example, Namibia's REER only fell by 5% in 2002 and rose by 12.5% in 2003 despite the fluctuation of the Rand. Additionally, it is not clear that if Namibia floated its currency it would experience more steady exchange rates. Given that Namibia's economy is

small, its currency could be vulnerable to changes in capital flows and its world demand for its exports.

The Namibian government, in an attempt to regulate capital outflow, introduced Regulation 28 that requires 35% of pension or life insurance funds to be invested in domestic instruments. According to Uanguta, Haiyambo, Kadhikwa and Chimana (2004), capital outflows through insurance and pension funds constitute a major portion of outflows from Namibia. Although the regulation has succeeded in the development of local asset management and prevention of investment in a single entity, it is likely to be ineffective since investors can freely and directly invest in other CMA countries. Moreover, Uanguta et al (2004) stated that "the fact that asset managers invest more in the shares of dual listed companies at the Namibian Stock Exchanges render Regulation 28 partially ineffective, because a portion of 35% required to be invested locally flows out in the form of investment in shares of dual listed companies."

In addition, Shoubourne and Stork (2004) argued that, Regulation 28 did not achieve the objective of diverting Namibia's saving from South Africa. Approximately only 5% of the 35% requirement was invested in the Namibian private equity, the rest is mainly invested in cash and government bonds; however, this could not lead to higher growth in the economy as excess funds could not reduce interest rates, since Namibia's interest rates cannot deviate much from those of the CMA member countries. As a result of this limitation, Regulation 28 has been revised, which came into effect on 1 July 2011. Under the new regulation, a pension fund may now invest up to 10% of the aggregate fair value of its assets into a private equity fund which is required to comply with a number of conditions.

In addition, according to the researcher's findings, the only proposed amendment to Regulation 28 that pension funds companies were aware of is the increase in the domestic investments to

45% of assets. Most of the pension funds have invested more than 45% in domestic assets already, and, therefore, little impact is expected on pension funds or the financial markets. The amendment was introduced by government in light of the liquidity problems, to hopefully bring back some capital for domestic (mostly, bank and government) funding.

Nevertheless, the reduction in the investment in cross listed shares on the Namibian Stock Exchange (NSX) to 10% by 2018 may present problems for pension funds. But because of the above scenario, no impact is expected unless the cross listings reduce, i.e., if companies decide to de-list from the NSX due to a lack of trading in securities and the cost of remaining listed. However, this is an old provision, not a new amendment.

2.3 Overview of the inflation rate in Namibia

Figure 2.1
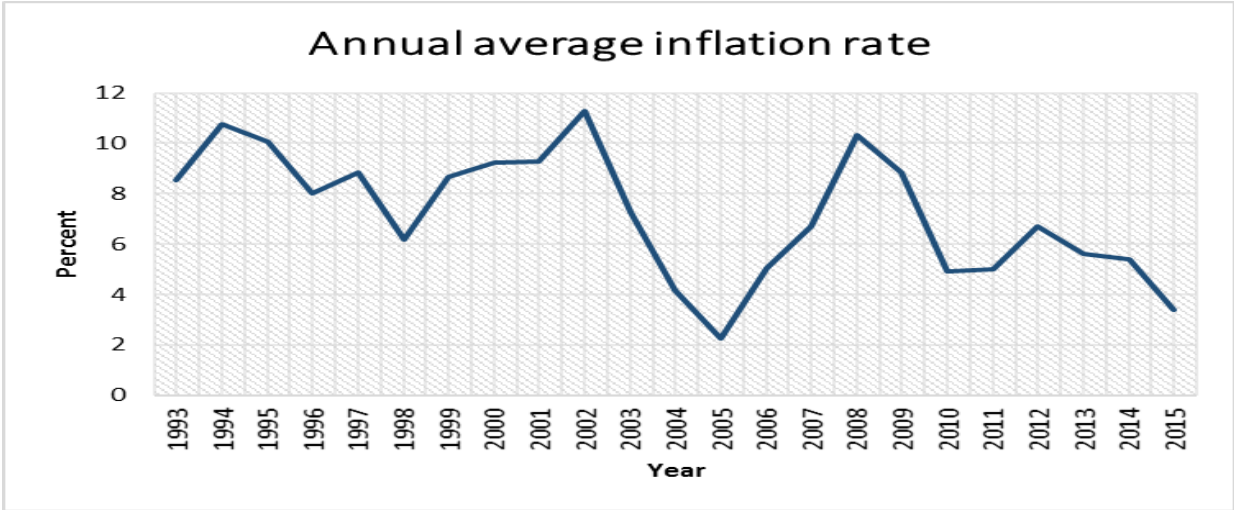
Source: Bank of Namibia

During the period 1993-1994 inflation increased (as depicted by the upward trend in the figure above) mainly due to an increase in food prices. In addition, a 13% additional sales duty was levied on luxury goods. Conversely, Inflation decreased in 1995-1996 following a decline in South Africa's inflation. The decline was attributed to an appreciating South African Rand, high interest rates and the prospects of a good rain season. In 1998, the inflation rate further reduced due to monetary policy tightening by the central bank. Inflation began to increase in 1999-2001 mainly due to increases in international oil prices and favourable macroeconomic conditions, rise of inflationary pressure from imported goods, and an increase in food prices, respectively. Namibia's inflation rate also remained significantly higher than those of its trading partners, which had a negative impact on the country's international competitiveness during 2000. Inflation continued to increase at a slower pace in 2003 mainly due to increased food prices coupled with a weak Namibian Dollar and rising international oil prices. However, it declined in 2004-2005 mainly due to a set of macroeconomic forces which prevailed during 2004 and a decline in prices of major components of the consumer basket (Likukela, 2007).

Inflation showed an upward trend during 2005-2007 which emanated from a prudent fiscal and monetary policy, a favourable external environment, and a high and persistent rise in international crude oil and food prices. Inflation was also high at the beginning of 2008 due to stronger increases in oil and food prices; nevertheless, towards the end of 2008, the inflation rate decelerated due to monetary policy tightening and a stronger Namibian Dollar. Namibia experienced subdued inflation during 2009 largely in line with the decline in international oil and food prices coupled with a reduction in global demand as a result of the global economic crisis. Inflation further depicted a downward trend during 2010.

Inflation substantially increased during 2011-2012 due to increases in the price of food and non-alcoholic beverages, transport and housing, water, electricity, gas and other fuels. However, it declined in 2013-2015 as a result of a reduction in food and transport inflation, and a decline in housing, water, electricity, gas and other fuels prices (BON, 2015).

2.4 Overview of the Real exchange rate in Namibia
Figure 2.2
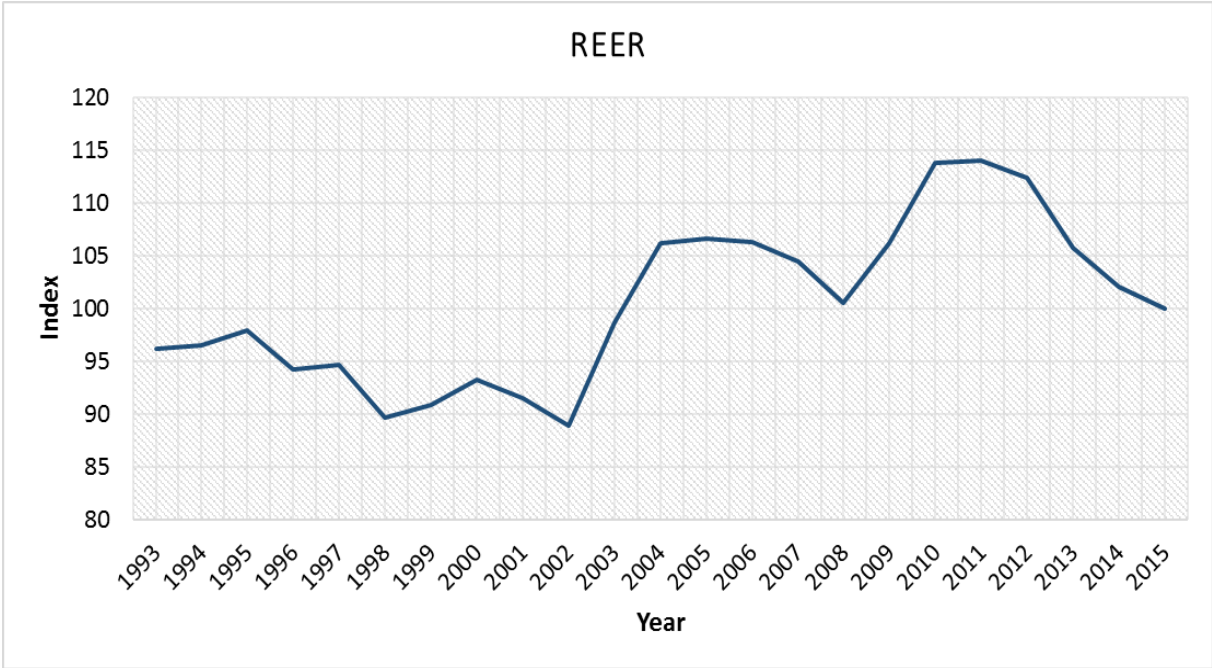
Source: Bank of Namibia

Namibia's Real Effective Exchange Rate (REER) slightly appreciated during 1993-1995 which resulted in Namibia's exports to become less competitive on international markets, before depreciating in 1995-2002. During 2003, the REER, substantially increased from 84.7 points in the preceding year to 90.8 points, representing a rise of 7.2% over the given period. On the other hand, the REER gradually declined to 100.3 points in 2004 from 102.4 points in 2003, representing a drop of 2.0% over the given period, before reducing by 7.3% (slightly) in 2005.

The real exchange rate depreciated in 2005, 2006 and continued in 2007. The continuation of the depreciation during 2007 was mainly due to the weaker Namibian Dollar, causing the index to fall marginally from 96.1 in 2006 to 95.6 in 2007. The REER also depreciated in 2007 reaching a point of 90.0, compared with 90.4 in 2006 according to Bank of Namibia (2007). As a result, Namibia experienced a current account surplus from 2000 to 2008.

During 2012-2015, the real exchange rate appreciated, which implied a loss in the competitiveness for Namibia's export commodities on the international market as they became more expensive. The RER further appreciated in 2010-2011 due to a strong Namibian Dollar (BON, 2011).

The REER depicted a downward trend in 2012-2015 due to Namibian products gaining competitiveness on the international markets. Furthermore, Namibia's REER has depreciated since 2012, with an acceleration in 2015. On average, Namibia's REER has depreciated by about 30% since the end of 2010, and 12% only in 2015. Since the Namibian Dollar is pegged to the South African Rand, the movement in its exchange rate closely follows that of the Rand, although in real terms the depreciation in the Namibian Dollar is slightly lower than that of the Rand (BON, 2015).

2.5 Overview of capital flow in Namibia
Figure 2.3
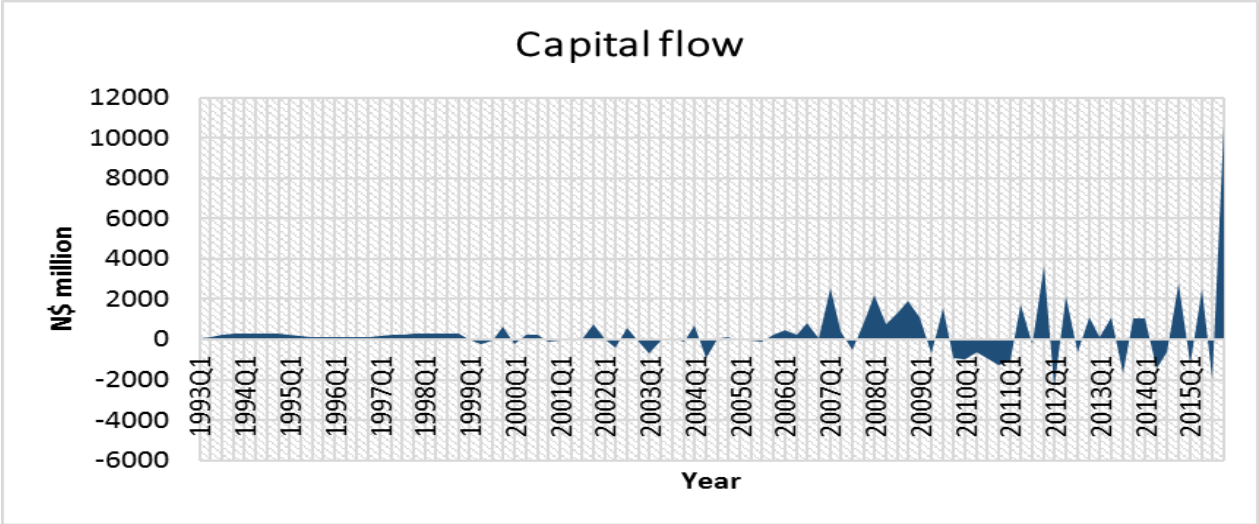
Capital flow

Source: Bank of Namibia

Capital flows which have helped drive Namibia's economic growth include: foreign direct investment (FDI), portfolio investment flows, and foreign aid. Private investment in Namibia is influenced mainly by foreign direct investment, and has played a significant role in determining the direction and pace of economic growth. Namibia has experienced robust FDI inflows since 2005; however, it continued to have persistent capital outflow in the form of portfolio investment since the capital market is too small to support portfolio investment holdings of pension and insurance companies' funds. During 1999 Namibia experienced capital outflow amounting to N$600 million, or 3.2% of GDP. Moreover, the BOP recorded a deficit despite an increase in FDI and other investments mainly due to a substantial increase in outflows on short and long term transactions that dominated the financial account.

During 2000, the amount of capital outflow increased compared to the preceding year due to smaller aid funds and an outflow on long-term investment capital of insurance companies and pension funds. In addition, net outflows on portfolio investment rose significantly in 2000 compared to 1999. Capital outflow further increased in 2003 and 2004 compared to 2002 as a

result of huge net outflows in other long-term and portfolio investment, which were strong enough to offset the inflows in capital transfers and FDI into Namibia. Moreover, the BOP recorded a deficit of N$2.7 billion in 2002 compared to a deficit of N$147.2 million in the previous year, (BON, 2002).

Capital outflow reduced in 2005 mainly due to a decline in net outflows in FDI and other long-term investments; nevertheless, portfolio investment and short-term investment outflow increased during the same period. The effect of the global financial crisis led to portfolio investment outflow declining from 2007 to 2008, as share prices collapsed, and most investors started looking for safe havens.

During 2010, Namibia further experienced capital outflow in the form of portfolio investment. Other long term investments also recorded an increased outflow compared to the amount of capital inflow, which led to a wider balance of payment (BOP) deficit. On the contrary, capital flow increased in 2011 due to increased FDI, other investments and a reduction in outflows from portfolio investment following the issuance of the Euro bond during the same period. Consequently, the BOP also recorded a surplus of N$4.0 billion compared to a deficit of N$2.3 billion in the previous year (BON, 2011).

During 2012, capital inflows reduced following a reduction in FDI, net capital transfers and large net portfolio outflow. The BOP also recorded a smaller surplus during this period. Conversely, capital inflow increased in 2013 and 2014 as a result of increased FDI inflows and inflows from other long-term investment. Nevertheless, FDI inflows were slightly lower in 2014 compared to the preceding period (as a result of a decline in invested equity capital). Capital inflow further increased in 2015 mainly due to the issuance of the Eurobond. Similarly, the BOP recorded an

increased surplus of N$32.7 billion from N$12.2 billion in the previous year as a result of increased FDI and portfolio investment inflow (BON, 2015).

2.6 Overview of real exchange rate misalignment
Figure 2.4
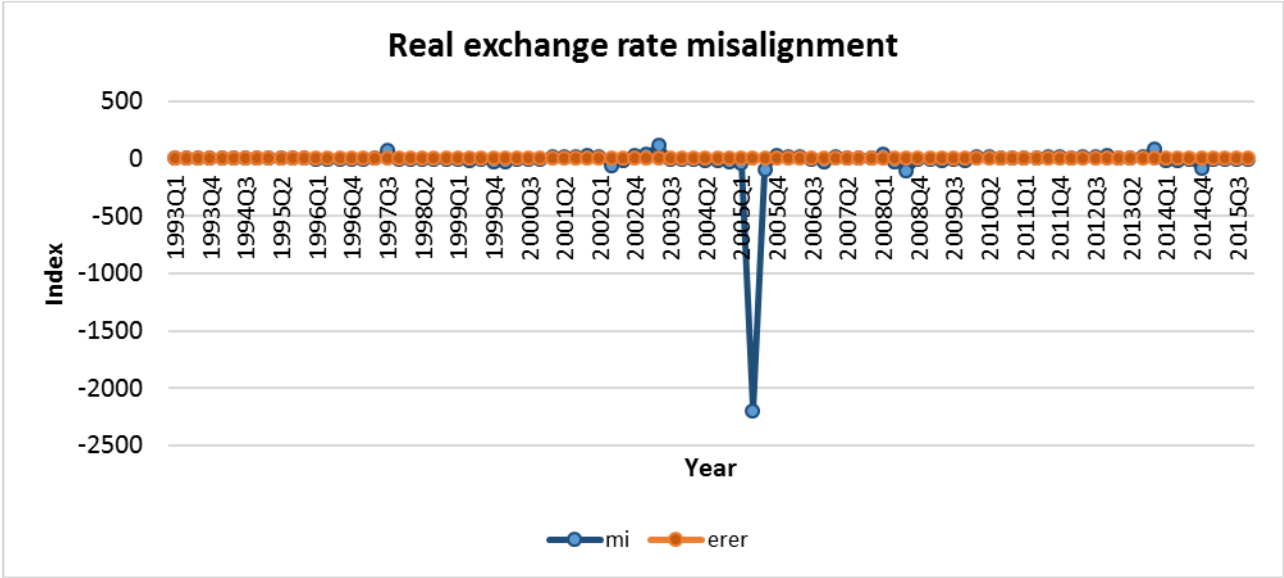
Source: Author's construct

The Namibian REER experienced a slight misalignment during the period 1993 to 2000. The Namibian Dollar was undervalued during 2001-2005 mainly due to the weakening of the Namibian Dollar (Miyajima, 2007); however, in 2005 the degree of undervaluation narrowed due to a narrow distance from the equilibrium level during 2005, which was consistent with the fact that the Namibian Dollar fell in the preceding years in line with the South African Rand and increased towards 2006.

In 2008, REER deviated from its equilibrium level and the REER experienced an overvaluation, which further persisted in 2009 but at a slower rate. During the period 2010-2014, Namibia experienced a slight overvaluation, as depicted in the graph above. Tjirongo (1998) found that RER misalignments in Namibia were small, while the extent and speed of pass-through was complete and instantaneous for most items, which suggested that nominal devaluations in Namibia were not likely to have real effects.

2.7 Overview of the economic growth in Namibia
Figure 2.5
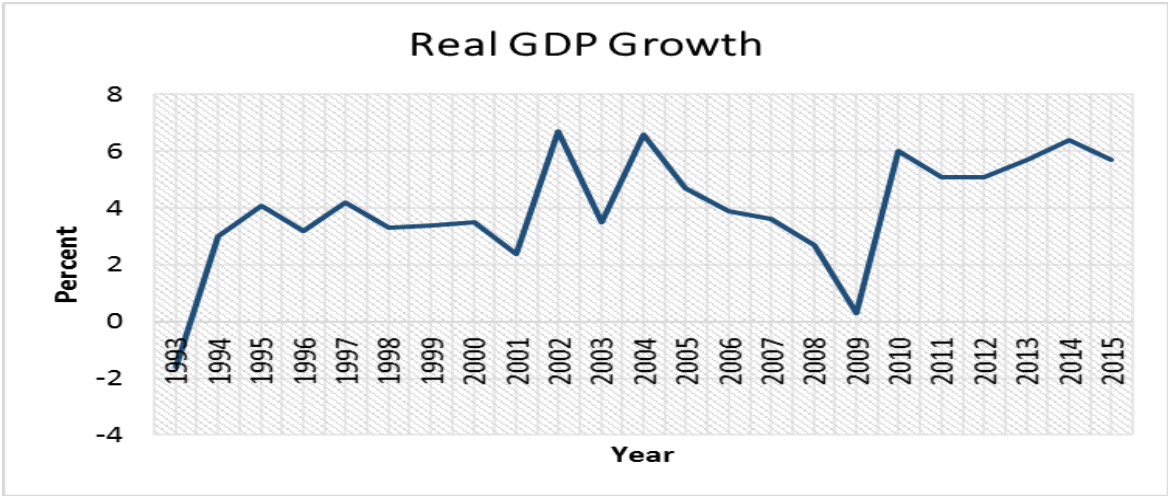
Source: Bank of Namibia

The Namibian economy recorded a positive growth rate during 2000 in sectors such as agriculture (as a result of better rainfall), mining, manufacturing, transport and communication, wholesale and retail trade, tourism and government. However, growth in the fishing and electricity and water sectors declined during the same period. During 2001 the economy grew by 2.5 percent which was slightly lower than the growth of 2000. The lower growth in 2001 resulted from declines registered in the outputs of sectors like mining, fishing, transport and communications, electricity and water, and hotels and restaurants. Economic growth continued to grow in 2002-2003, but at a slower rate in 2003 due to a contraction experienced during the first quarter of the same year. Economic growth increased during 2002-2003 as a result of increased growth recorded in the secondary and tertiary sector. An increased growth of 5.9% was recorded during 2004; however, it slightly reduced to 4.2% in 2005 due to a decline in the value added in total primary industries, mainly ascribed to the poor performance in the mining and fishing sectors and a slight deceleration in the value added growth of the tertiary industries. Economic growth further increased in 2006 owing to strong performance in the secondary and tertiary industries.

The pace of economic growth slowed down during 2007-2009 due to persistent inflationary pressures as a result of high food prices coupled with high international oil prices and the global economic crisis which negatively affected its performance, especially in export oriented sectors, such as diamond mining and tourism. The Namibian economy expanded by 4.6% during 2010, compared to a contraction of 0.7% in the preceding period, due to a recovery in the demand for imports, particularly diamonds, following the global economy recovery. As a result, the primary industry expanded. Similarly, the secondary sector expanded due to the recovery in the construction sector, supported by an expansionary budget.

The economy further grew during 2012-2014 in line with increased growth in the mining sector, notably in the diamond and uranium sectors following an upsurge in investments. Likewise, the secondary industry improved, which was largely attributed to a rise in construction activities on the backdrop of increases in public infrastructure and property developments. On the contrary, economic growth declined in 2015 mainly driven by lower growth rates in the construction sector, agricultural sector ascribed to prevailing drought, wholesale and retail trade sectors (BON, 2015).

2.8 Overview of interest rate differential in Namibia
Figure 2.6
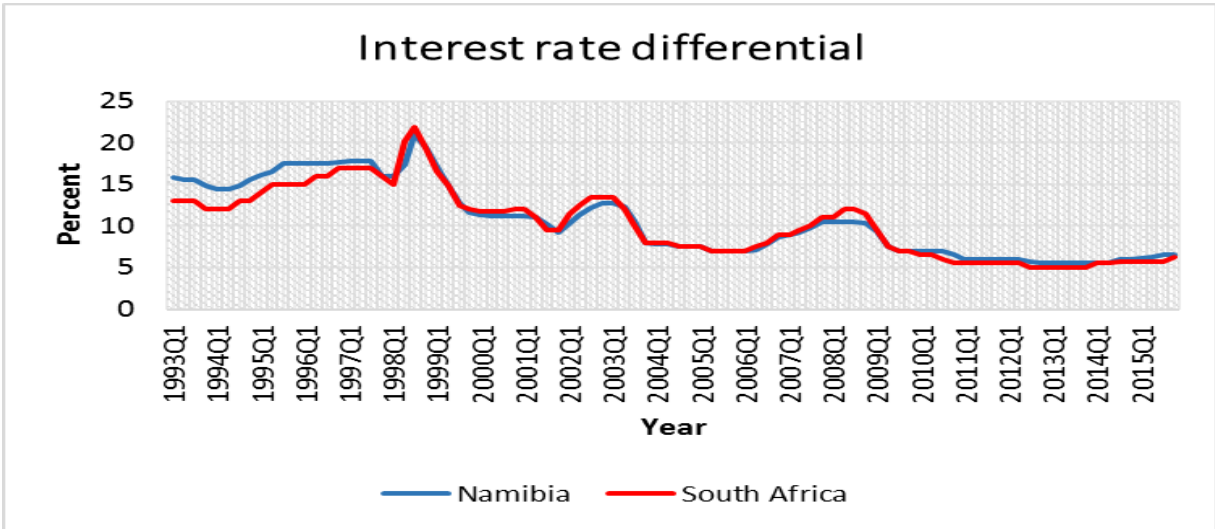
Source: Bank of Namibia

Due to Namibia's membership of the Common Monetary Area (CMA), the interest rate movement largely traces that of South Africa, although differentials sometimes occur. Moreover, Namibia cannot have interest rates below those of South Africa for a sustained period of time without facing capital outflow within the CMA area, as funds seek the maximum return. As depicted by the graph above, there was a slight difference in interest rates between South Africa and Namibia during the period 1993 to 1997; however, thereafter movements in the Namibian interest rates were closely linked to that of South Africa during the period 1998-2015.

CHAPTER THREE: LITERATURE REVIEW

3.1   Introduction

This chapter provides a review of related literature. The purpose of this chapter was to give the foundation of the research, previous research and theories related to the relationship between the RER misalignment and capital flow. The presentation of this chapter is divided into three sections. Section 3.2 provides a discussion on the theoretical literature on the concept of real exchange rate, equilibrium real exchange rate and its relation to capital outflow. The discussion on the related empirical literature is presented in section 3.3. The summary of the chapter is provided in section 3.4.

3.2   Theoretical Literature

The equilibrium real exchange rate (ERER) is defined as that relative price of tradable to non-tradable which results in the simultaneous attainment of internal and external equilibrium, where internal equilibrium occurs when the non-tradable goods market clears in the current periods and is expected to attain equilibrium in future periods at full employment level. On the other hand, external equilibrium is achieved when the current account balances (current and future) are compatible with long-run sustainable capital flows (Edwards, 1989).

A number of implications that rise from the definition of equilibrium real exchange rate is that the real equilibrium exchange rate is not an immutable value since changes in variables that influence external and internal equilibriums do not affect the ERER. Moreover, the ERER will not only be affected by current fundamentals but by expected evolutions of variables in the future, to be specific changes in the behaviour of ERER will depend on whether the fundamental changes are permanent or not. Therefore, a distinction between short-run and long-run equilibrium real exchange rates is crucial (Edwards, 1989).

From a policy point of view, it is crucial to determine the equilibrium value of the real exchange rate in order to assess whether the actual real exchange rate is misaligned (that is overvalued or undervalued). Furthermore, exchange rates determine the current account position, which is affected by the real rather than nominal exchange rates (Edwards, 1989). Edward (ibid) further found that a problem with a number of models on the equilibrium real exchange rate is that they do not allow for a distinction between the effects of temporary and permanent changes in the real exchange rate determinants which can be crucial in some policy discussions. For instance, Neary's model is basically static and does not allow a distinction between temporary and permanent shocks, or between anticipated and unanticipated disturbances.

According to Chowdhury (1999), Edward's model captures most features of a small open developing economy and allows only the "fundamental" or real variables to play a role in determining the long-run equilibrium RER, whereas the actual RER in the short run is influenced by both real and nominal and real factors. The model further assumes an economy which only produces and consumes tradable and non-tradable goods. Export and import goods are aggregated into one tradable category. Moreover, the government consumes both goods and finances its expenditure through domestic credit creation and non-distortionary taxes. The model further assumes that there are no capital controls, there are capital flows in and out of the economy and tariffs on imports.

The model postulates that the demand and supply of tradable and non-tradable goods is determined by the real RER and level of real assets. The long-run RER equilibrium is achieved when the non-tradable goods market and the external sector are simultaneously in equilibrium. This implies that the current account is equal to the capital account in the long-run. According to the Edward's model, an increase in domestic money results in higher real wealth and current

account deficit. To attain equilibrium real wealth, the price of real assets will have to rise - which in turn increases the price of non-tradable goods and cause real appreciation to rise. On the other hand, a rise in the price of tradable goods causes the RER to depreciate given that the price of the non-tradable goods and nominal exchange rate remains constant. However, if the rise in the price of tradables increases export earnings and is spent on the non-tradable sector, the demand and the prices of non-tradable goods rises more relative to the tradable goods resulting in the appreciation of the RER. Furthermore, the total effect of an import tariff depends on the initial expenditure on domestic non-tradables and imports.

Edward's model further stipulates that the long run equilibrium RER is only influenced by real variables. The government consumption, the value of real assets, price of tradable and non-tradable goods and trade restrictions are usually influenced by changes in other real variables such as terms of trade disturbance, government expenditure, technological progress and changes in trade and capital restrictions. Changes in the real or fundamental variables have important effects on ERER and can result in its deviation from the equilibrium value, which is known as structural misalignment. Moreover, this misalignment can therefore imply loss or gain of external competitiveness. The fundamental values which affect the ERER are discussed below (Chowdhury, 1999):

Terms of trade (TOT) disturbance: The TOT is considered as one of the most important external fundamental and major determinant of RER; however, its effect on the RER is ambiguous. The TOT have two effects on the RER, namely the substitution and income effect. The income effect arises when the price of exports increases or the price of imports reduces which results in an increase in income and the demand for non-tradable goods. This consequently reduces the relative price of tradable to non-tradable and causes an RER

appreciation. Conversely, the substitution effect arises when an improvement in the TOT due to an increase in export prices results in an RER depreciation for given levels of nominal exchange rate and non-tradable prices. But if the improvement in TOT is brought about by only a fall in import prices, then the improvement in the current account balance would increase income and the aggregate price of the non-tradable and thus lead to an appreciation of the RER; therefore, there is ambiguity about the total effect of TOT disturbance on the RER.

Trade restrictions: trade restriction in the form of tariffs results in a RER appreciation. If it worsens the current account position and raises the demand and price of non-tradables, the result will be an appreciating RER. Moreover, an increase for import quota increases the demand for import substitutes, which results in higher prices and profitability for non-tradables and therefore, leads to a RER appreciation. On the other hand, if tariffs increase, it leads to a deteriorating current account deficit and reduces the demand for non-tradables, the RER will depreciate.

Technological progress: technological progress increases the productivity, competitiveness and efficiency of the tradable sector which increases factor availability and therefore tends to depreciate the RER of the sector. However, if technological improvement increases income which in turn increases the demand for non-tradables and reduces the relative price of tradable to non-tradable, the RER will appreciate.

Government expenditure: An increase in government expenditure increases the demand and price for non-tradable goods if most of the expenditure is spent on non-tradables, thereby leading to a RER appreciation. However, if a greater portion of government expenditure is spent on tradables, the RER will depreciate.

Cahyono (2008) states that there are numerous methods for estimating the equilibrium real exchange rate (ERER). For instance, the relative PPP-based approach, the trade-equation approach, the structural general equilibrium approach and the reduced form general equilibrium. This study however only focused on three approaches which are explained below:

The relative PPP-based theory: The theory of the purchasing power parity is the simplest technique for calculating the equilibrium exchange rate that is free from transitory disturbances. Moreover, the equilibrium real exchange rate is determined by the base year of actual exchange rate. However, this approach has some weaknesses: firstly, it is difficult to identify a suitable base year; secondly, the ERER assumes to be constant and; third, the approach is less appropriate since it assumes that the relative price is the only determinant of ERER.

The trade equation approach: This approach is commonly used in an open economy, where the role of RER is to influence the resource balance through expenditure-switching mechanism, therefore the ERER is not constant. The purpose of this mechanism is to attain external and internal balance by switching to domestic expenditure from imports to domestic goods or vice versa. In addition, the mechanism involves using policy instruments such as revaluation or devaluation (Dwivedi, 2005). The shortcoming of this approach is the difficulty in choosing the appropriate resource balance to estimate ERER, which may also depend on other variables than RER.

The behaviour equilibrium exchange rate (BEER) approach: This approach is also used in the calculation of the RER. According to Dwivedi (2005), this approach is more appropriate for developing countries in which complex models are not suitable since there is a limitation of data. Moreover, in order to implement this approach, the fundamental variables influencing the RER should be identified.

The core Dutch Disease model, modelled by Corden and Neary (1982) and Corden (1984), postulates a booming traded sector (assumed to be natural resources), a non-booming traded sector (manufacturing), and a non-traded sector (services). The booming sector is of an extractive kind, while the non-booming sector will be influenced at the expense of the trading sector. In order to determine the structural aspects of a boom, the implication of real rather than nominal variables are considered. The Dutch Disease is defined as the increase in the economic development of one sector relative to other sectors such as manufacturing or agriculture; the assumption was that as revenue increases in a sector, the country's currency appreciates. Consequently, exports become expensive and drive up the value of the currency while imports become cheaper resulting in a lack of competition in the international market.

The Dutch disease manifests itself in two ways namely: through the resource movement effect and spending effect; the boom in the energy sector raises the marginal product of mobile factors employed within it and the equilibrium wage rate, thereby moving resources from the manufacturing and non-tradable sector leading to various adjustments in the rest of the economy such as the real exchange rate mechanism. However, if a few resources are diverted from other sectors this effect may be negligible and the major effect of the boom can be analysed through the spending effect. A boom resulting from an increase in world prices results in an increase in income and an appreciation of the RER.

There are two methods which can be used to curb the "Dutch disease" threat. Firstly, by reducing the RER appreciation, this can be done through the approach of sterilising boom revenues, in other words a country should not bring in all its revenue at once, it could save abroad in special funds and bring in revenues slowly. This ensures certainty of revenue flows throughout the years. Another approach would be to induce savings in order to reduce capital inflow which may result

in the appreciation of the RER. This can be done through a budget surplus; a country can encourage saving through a reduction in profit and income taxes. Moreover, an increase in saving can reduce the need for loans to finance the government deficit and foreign direct investment. Secondly, the "Dutch disease" threat can be reduced by increasing the competiveness of affected sectors that is investing in education and infrastructure and government protection of the non-booming sector.

3.3 Empirical Literature

There is voluminous empirical literature on this subject around the world. Alper and Saglam (1999) scrutinised whether the equilibrium exchange rate framework contributed to the understanding of misalignments in the real exchange rate in Turkey and whether it could be used as a guideline for policy interventions by the monetary authorities. The study applied the Johansen's full-information maximum-likelihood methodology of co-integrated systems (Johansen, 1988) to estimate the ex-post ERER in an emerging market economy for the period 1987-1999. Estimation results indicate the relevance of the equilibrium real exchange rate model for Turkey.

AtiqurRahman and Basher (2002) adopted a single equation approach to examine the real exchange rate behaviour and exchange rate misalignment in Bangladesh over the period 1977-1998 and found that real exchange rate and the macroeconomic fundamentals affecting real exchange rate forms a co-integrating vector. Furthermore, trade liberalisation and increase in debt service burden results in a real depreciation of currency; while increase in capital inflow, improvement in terms of trade, and increase in government consumption of non-tradable goods result in a real appreciation of currency. Nominal devaluation has been able to partly retain its effect to have a real devaluation in the short-run. Estimation of long-run equilibrium real

exchange rate revealed that Bangladesh currency was considerably overvalued until the late 1980s. However, real exchange rate was broadly in equilibrium during the 1990s except very lately.

Villavicencio (2006) examined the determinants of the real effective exchange rate and evaluated the degree of misalignment, the analysis considered quarterly data for the period 1980 Q1-2005 Q4 and included seventeen currencies. Within a panel co-integration setting, the relationship between the exchange rate and a set of economic fundamentals was estimated, such as traded-nontraded productivity differentials and the stock of foreign assets. After ascertaining that the variables were integrated and co-integrated, the long-run equilibrium values of the fundamentals were estimated and used to derive equilibrium exchange rates and misalignments. Although there was statistical homogeneity, some structural differences existed between advanced and emerging economies.

Nabli, Keller and Veganzones (2007) analysed the relationship between the extent of exchange rate misalignment and the choice of exchange rate regime across a panel of countries over the 1970-1999 period based on the approach used by Edwards (1989) and extended by Elbadawi (1994) and Baffes, Elbadawi and O'Connel (1997), and showed that the MENA region has suffered from substantial exchange rate overvaluation which, though highest over the 1970-1985 period, has persisted into the 1990s. It was estimated that over the 1985-1999 period, the degree of exchange rate overvaluation in MENA averaged some 22%, higher than any other region but CFA Africa. Moreover, the effect of exchange rate overvaluation on the competitiveness of non-oil exports was calculated. It was estimated that the overvaluation of exchange rates has reduced the region's manufacturing exports – as a percentage of GDP per year by about 18% over the 1970-1999 period.

Sidek, Yusoff and Munir (2009*)* investigated the impact of exchange rate misalignment on capital inflows in Malaysia, from 1991: Q1-2008: Q3. Partly dictated by availability, a precise threshold value was estimated to examine when exchange rate misalignment suppresses capital inflows. The study relied on the endogenous threshold analysis as of Hansen (1996, 2000). The results revealed that misalignment in terms of currency overvaluation, has a negative and significant effect when overvaluation is more than 15%. Moreover, the estimate was consistent and robust despite the changes in the choice of explanatory variables.

Combes et al. (2011) analysed the impact of capital inflows and the exchange rate regime on the real effective exchange rate. The study was based on a wide range of developing countries (42 countries) for the period 1980–2006 with estimation centered on panel co-integration techniques. The results revealed that both public and private inflows cause the real effective exchange rate to appreciate. Among private inflows, portfolio investment had the biggest effect on appreciation, almost seven times that of foreign direct investment or bank loans, and private inflows have the smallest effect. Using a *de facto* measure of exchange rate flexibility, it was found that a more flexible exchange rate helps to dampen appreciation of the real effective exchange rate caused by capital inflows.

Korsu and Braima (2011) investigated the determinants of the real exchange rate for Sierra Leone by controlling also for the effects of price changes, by using annual aggregate data from 1970 to 2005. The estimated model was based on the inter-temporal optimising framework of Edwards (1989). The unit root and co-integration tests were used and an error correction model of the actual real exchange rate model was estimated in the context of Hendry's general-to-specific modeling, while the equilibrium real exchange rate was estimated using the Johansen Maximum Likelihood procedure. The results indicated that increases in the price level, capital

inflow, capital accumulation and trade restrictions appreciate the actual real exchange rate, while increases in the nominal exchange rate and output depreciate it. Therefore, for a real depreciation to be sustained, policy makers should strengthen efforts to control the rate of inflation and concentrate revenue from capital inflow on investment in the tradable goods sector.

Sohrabji (2011) analysed the link between capital flows and real exchange rate overvaluation which in turn is associated with financial crises. The econometric work noted earlier is estimated using annual data from 1975 to 2006. The equilibrium real exchange rate is estimated for India using Edwards (1989) model and co-integration and error correction methodology. From this, misalignment in the real exchange rate was computed and analysed through a vector auto regression. The results revealed that capital flows are an important contributor to real exchange rate misalignment. This explained the overvaluation of the rupee associated with increased foreign investment in recent years. Thus, the continued emphasis on foreign investment raised concerns for a financial crisis in India.

Similarly, Oriavwote and Oyovwi (2012) investigated the determinants of the real exchange rate in Nigeria, with data covering 1970-2010. The parsimonious ECM result showed amongst others that the ratio of government spending to GDP, terms of trade and technological progress are not important determinants of the real effective exchange rate in Nigeria. The results showed that capital flow, price level and nominal effective exchange rate are important determinants of the real effective exchange rate in Nigeria. The study further suggested that the Dutch Disease syndrome holds in Nigeria. The Johansen co-integration test indicated a long-run relationship among the variables. Finally, it was recommended that policies have to be put in place to stabilise the problem of inflation.

Musyoki, Pokhariyal and Pundo (2012) examined the Real Exchange Rates (RER) misalignment in Kenya by using Johansen co-integration and error correction technique based on single equation and Vector Autoregressive (VAR) specification. It was found that actual RER was more often above its equilibrium value for the study period of June 1993 – December 2009 and the country's international competitiveness deteriorated over the study period.

Ibrahim (2013) examined the effects of real exchange rate misalignment on capital inflow in Nigeria between the year 1960 and 2011. Moreover, the study computed real effective exchange rate using 17 trading partners of Nigeria, while the purchasing power parity (PPP) adjusting for Ballassa-Samuelson approach was employed to obtain equilibrium real exchange rate over time. Also, the two stage error correction method developed by Engel and Granger (1989) was used to find the effects of real exchange rate misalignment on foreign direct investment (FDI) inflow in the country. The paper observed that the extents of misalignment vary from time to time within the period of study and that this misalignment has a significant depreciating effect on the inflow of FDI to the country. The study recommended an open guided exchange rate system in order to minimise the extent of real exchange rate misalignment and thus reducing its effects on major economic indicators such as foreign direct investment.

Gouider and Nouira (2014) analysed the role of the misalignment of the real exchange rate in capital flight for a sample of developing countries over the period 1980-2010. The econometric methodology used in the study was based on Edwards' (1989) approach. Firstly, the degrees of misalignment for all countries of the sample were calculated, for which degrees were introduced as a determinant of capital flight. Then, the effect of the overvaluation and the undervaluation on capital flight was examined. The results show that a strong undervaluation may discourage capital flight, while a strong overvaluation can stimulate it.

Ebaidalla (2014) analysed the behaviour of equilibrium exchange rate and real exchange rate misalignment in Sudan over the period 1979–2009. Moreover, the impact of real exchange rate misalignment on economic performance was examined. The empirical results showed that the equilibrium exchange rate was significantly influenced by policy variables such as trade openness, government expenditure and taxes. The results also revealed that Sudanese experienced an exchange rate overvaluation and a low volatility of RER owing to huge inflows of foreign exchange. Moreover, the results demonstrated that exchange rate misalignment has a deleterious impact on Sudanese export performance.

Eita and Sichei (2014) estimated the equilibrium real exchange rate for Namibia for the post-independence period (1998 to 2012) using quarterly data. The equilibrium real exchange rate and the resulting real exchange rate misalignment for Namibia was estimated using the Johansen (1988, 1995) full information maximum likelihood (FIML). The study then applied a vector auto regression (VAR) methodology in order to test the impact of real exchange rate misalignment on economic performance. Increases in the ratio of investment to GDP and resource balance were associated with an appreciation of the real exchange rate. The terms of trade caused the real exchange rate to depreciate, which suggests that the substitution effect was dominant over the income effect. The real exchange rate adjusted to equilibrium rate while the speed of adjustment indicated that it takes about 4.4 quarters or 1.1 years for 50% of the deviation from the equilibrium to be corrected. There were periods of undervaluation and overvaluation of the real exchange, which means that the real exchange rate experienced misalignment.

Ng'ambi (2015) analysed the effect of exchange rate volatility on capital flows for the period 2000:q1 – 2014:q3 in South Africa and further examined the impact of the exchange rate volatility exerts on the different forms of capital flows. A trade weighted exchange rate was

constructed from which the conditional variance GARCH (1, 1) model was applied to estimate exchange rate volatility. The results revealed that exchange rate volatility has a statistically significant negative impact on the aggregated capital flows to South Africa. The study also employed the bi-variate vector auto regressions (VARs), the Granger-causality test, and impulse response and variance decomposition. The findings revealed that there is a dynamic interrelationship between exchange rate volatility and the aggregated and disaggregated capital flows. Furthermore, the VAR specifications results revealed that portfolio flows exhibit a strong bi-directional causality with exchange rate volatility.

Even though studies by Eita and Sichei provide insight about exchange rate misalignment and economic performance in Namibia, this study has more time series data, and it uses a different methodology approach which follows recent developments in time series econometrics. Moreover, the study by Eita and Sichei focused on the impact of real exchange rate misalignment on economic performance while this study concentrated more on analysing the relationship between real exchange rate misalignment and capital flow in Namibia.

3.4 Conclusion

To conclude, it is apparent from the literature review that some form of relationship exists between real exchange rate misalignment and capital flows as shown by the various researchers. The outcomes obtained by the researchers regarding the relationship varied as a result of several econometric analytical tools used by the authors, numerous countries under investigation and various variables applied when determining the equilibrium RER.

This chapter reviewed Edward's equilibrium real exchange rate and the Dutch disease theoretical models. Edward's model postulated that the long-run RER equilibrium is achieved when the

non-tradable goods market and the external sector are simultaneously in equilibrium. On the other hand, the Dutch disease model, which postulates a booming traded sector, a non-booming traded sector, and a non-traded sector assumes that as revenue increases in a sector, the country's currency appreciates.

Most of the empirical results revealed that exchange rate misalignment in terms of an overvaluation and undervaluation has a detrimental effect on capital flow.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1   Introduction

This chapter explains the analytical framework that is utilised in this study based on the literature reviewed in Chapter 3. This chapter is structured into two sections: section 4.2 discusses the econometric framework and model specification of which Unit Root test, Bound test, Co-integration Error Correction model as well as the estimation of the inflexion point for misalignment are fully explained. Section 4.3 discusses the data and data sources.

4.2   Econometric Framework

This study adopted Khan, Ali, and Khalid's (2016) method of applying an Autoregressive Distributive Lag Model (ARDL) of co-integration to test both long and short-run relationship amongst the variables. The model has been modified to suit it to the specific context of Namibia, interest rate differential, misalignment index, and GDP has been included as independent variables, furthermore, capital flow is expressed as a dependent variable and the RER as an independent variable. Capital flow is expressed in equation 4.1 as a function of the real exchange rate, inflation rate, interest rate differential and misalignment index:

CF=F   (RER,   INF,   ID,   MI,   TOT,   GDP) …………………………………………………………….4.1

The above equation was transformed into natural logarithm as follows:

$$CF_t = \alpha_0 + \alpha_1 LNRER_t + \alpha_2 LNINF_t + \alpha_3 ID_t + \alpha_4 LNGDP + \alpha_5 LNTOT + \alpha_6 MI_t + \mu_t ....4.2$$

Where CF is the Capital flow in time t, which is the dependent variable. The independent variables are: RER= is the real exchange rate, INF is the inflation rate, ID is the interest rate differential, GDP is the gross domestic product, TOT is the terms of trade and MI is the

misalignment index. The subscript t referred to time, μ is a white noise error time and all variables are expressed in natural logarithm, with exception of interest rate differential, capital flow and the misalignment index, which have negative values.

The study further followed Ahmed's (2009) methodology in determining a misalignment index which was used to calculate the extent of deviation in the real exchange for the period 1993–2015, where an index value of zero implies that the actual RER is fairly valued and a positive or negative index value implies that the actual RER is undervalued or overvalued relative to the equilibrium rate.

$$\text{Misalignment Index} = \frac{RER_t - ERER_t}{ERER_t} \quad \text{……………………………………………..………}$$

4.3

Where: RER is the real exchange rate, ERER is the equilibrium real exchange rate and the subscript t refers to time. Table 4.1 shows the expected signs of the coefficients on the explanatory variables. Inflation is expected to have a negative effect on capital flow. The effect of real exchange rate on capital flow is ambiguous. Inflation differential is expected to have a negative effect. According to Kumar (2014), if there is a positive expected return differential, there will be inflow of foreign capital in the economy. However, if expected return differential is negative, there will be outflow of foreign capital. The value of the misalignment index is expected to have a negative effect on capital flow. Capital flow is expected to have a positive impact on the terms of trade (TOT), because as capital flow increases it leads to a rise in the value of a country's currency and lowers the domestic prices of imports. Moreover, capital flow is positively associated with GDP, as GDP increases, capital flow also increases.

The autoregressive distributed lag (ARDL) version of the model that will be used to estimate the

$$\Delta CF_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta CF_{t-1} + \sum_{i=1}^{n} \alpha_{2i} \Delta LNRER_{t-1} + \sum_{i=1}^{n} \alpha_{3i} \Delta LNINF_{t-1} + \sum_{i=1}^{n} \alpha_{4i} \Delta ID_{t-1} + \sum_{i=1}^{n} \alpha_{5i} \Delta LNGDP_{t-1} +$$

$$+ \sum_{i=1}^{n} \alpha_{5i} \Delta LNTOT_{t-1} + \sum_{i=1}^{n} \alpha_{7i} \Delta MI_{t-1} + \beta_1 CF_{t-1} + \beta_2 LNRER_{t-1} + \beta_3 LNINF_{t-1} + \beta_4 ID_{t-1} + \beta_5 LNGDP_{t-1} +$$

$$\beta_6 LNTOT_{t-1} + \beta_7 MI_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 4.4$$

relationship between real exchange rate and capital flow is:

Where, Δ is the first-difference operator, β represents short-run dynamic of the model, α_o is a drift component and ε_t is the white noise error term.

Table 4.1

Variable and expected signs		
Variables	Symbol	Expected Sign
Real Exchange Rate	rer	-
Inflation	inf	-
Interest differential	id	+
Misalignment index	mi	**-**
Terms of trade	tot	+
Gross domestic product	gdp	+

4.2.1   Unit root test

In estimating the model, the following steps were followed. The study used the Kwiatkowski Phillips-Schmidt-Shin (KPSS) test for unit roots, and the Phillips-Perron (PP) (non-parametric) test to identify any basic structural breaks.

The reason behind the unit root tests is to know the order of integration and to examine the properties of the prior to the construction of an econometric model. In this case, unit root tests are carried out to classify series as stationary and non-stationary. The basic objective of the test is to test the null hypothesis that series have unit root (that is non-stationary) against alternative hypothesis that the series do not have unit root (that is stationary) (Sjo, 2008).

A stationary time-series may appear non-stationary if the intercept or trend exhibits structural breaks; the unit root test may lead to false acceptance of the null hypothesis when structural breaks are not considered (this is known as the type II error). Therefore, the data is examined to

determine if the variables are non-stationary and to which order they are integrated. If the variables are stationary, the variance is said to be constant and may have some element of autocorrelation overtime; however, if the variables are non-stationary, the series will have to be differenced until they become stationary to avoid spurious results in the estimations. Furthermore, if variables are not stationary the t-ratio will not follow a t-distribution, hence no accurate hypothesis tests can be undertaken about the regression parameters.

4.2.2   Bound test co-integration

In order to empirically analyse the long-run relationships and short-run dynamic interactions among the variables of interest, the autoregressive distributed lag (ARDL) co-integration technique were applied. According to Saradhi and Goel (2014) the ARDL co-integration has three main advantages. Firstly it does not require that all series must be integrated of the same order, it can be applied to variables purely integrated of order I(0), I(1) or mutually integrated. Secondly, the ARDL test is relatively more superior in the case of small and finite sample data sizes. Thirdly, by applying the ARDL technique one can obtain unbiased estimates of the long-run model.

In order to run the ARDL, the following conditions must be met: the variables must be integrated of I(0) or I(1). The dependent variable must be non-stationary in order for the model to behave better. None of the variables should be integrated of order 2 in normal conditions and in structural break. Variables integrated of I(2) provide spurious results and makes it difficult to interpret the F-statistics.

Before using the ARDL Bound test, the order of integration should be determined by using the unit root test. The first step in the ARDL approach is to estimate the equation using OLS by conducting the standard F-test to test the significance of the coefficients of the lagged levels of

the variables in an unrestricted error correction model (UECM). Pesaran, Shin and Smith (2001) generated two sets of critical values for a given significant level, the first level or lower critical bound is calculated based on the assumption that all variables in the model are integrated of order zero while the second level or upper critical bound is calculated based on the assumption that all variables are integrated of order one. If the calculated F-statistic exceeds both the upper and lower bounds critical values, the null hypothesis of no co-integration is rejected. If the calculated F- statistics value lies between the upper and lower bounds critical values, the co-integration test is inconclusive. If the calculated F statistics lies below the upper and lower bounds critical values, then it suggests the evidence of no co-integration among the estimated variables in the model. Therefore, the null hypothesis of no co-integration cannot be rejected.

4.2.3   Error Correction Model

Error Correction Model (ECM) exists if two or more non-stationary time series are co-integrated. Co-integration is a necessary condition for ECM. The ECM describes the long-run equilibrium relationship between non-stationary series, which can also be used to determine the equilibrium real exchange rate. Even though individual series are non-stationary, when they are co-integrated, there is a long-run equilibrium relationship. The ECM integrates the long-run equilibrium relationship with the short-run dynamic adjustment mechanism between two variables to describe how the series behave when they move out of the long-run equilibrium, without losing long-run information (Dağdeviren and Sohrabji, 2012).

The advantage of the EC model is that it can also be used to reflect the lagged changes, first differences and the level of the series in the system. Moreover, the ECM is powerful since it makes it possible to estimate both short term and long-run effects of explanatory time series variables. In addition, the differencing of the dependent variable in the model eliminates the

estimation of a spurious regression with near-integrated data. Finally, given that the error

correction model is a linear re-parameterisation of the ADL, it can be estimated with OLS (Keele

and De Boef, 2004).

$$\Delta CF_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta CF_{t-1} + \sum_{i=1}^{n} \beta_{2i} \Delta LNRER_{t-1} + \sum_{i=1}^{n} \beta_{3i} \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{4i} \Delta ID_{t-1} + \sum_{i=1}^{n} \beta_{5i} \Delta LNGDP_{t-1} +$$

$$\sum_{i=1}^{n} \beta_{6i} \Delta LNTOT_{t-1} + \sum_{i=1}^{n} \beta_{7i} \Delta MI_{t-1} + \gamma ECM_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 4.5$$

This study estimated the following ECM equation:

Where:

ECM is a residual obtained from the estimated co-integration equation 4.4.

$_\gamma$ is the parameter which represents the speed of adjustments in the long-run.

ε_t is the white noise error term

is a long-run coefficient.

In order to determine the reliability of the ARDL results, the serial correlation, functional form,

heteroscedasticity and the normality of the ARDL need to be checked.

4.2.4 Inflexion Point of Misalignment

The question, "when does misalignment begin to significantly affect capital inflows?" requires

the existence of a non-linear relationship between variables. Hence, if such non-linear

relationship exists, then it is possible to estimate an inflexion point, or a threshold value, at

which the sign of misalignment may change or become significant (Sidek, Yusoff and Munir, 2009).

In order to determine the inflexion point, the effect of the independent variable (X) on the dependent variable (Y) is allowed to change. Thus, if the value of X decreases or increases, the impact of the dependent or independent variable may decrease or increase. However, this relationship changes at some unique value or specific point of X. Moreover, a decreasing effect becomes increasing or an increasing effect becomes decreasing. Thus, the point at which this occurs is called the inflexion point. The null hypothesis states that a point of inflexion has occurred, while the alternative hypothesis states that a point of inflexion has not occurred. In this study, the inflexion point was determined by estimating the following non-linear regression using OLS:

$$CF = \beta_0 + \beta_1 X_1 + \beta_2 X^2{}_2 + \varepsilon_t$$ …………………………………………………………………………..4.5

Where X_1 and X_2 are explanatory variables or misalignment index

CF is the capital flow

β is an unknown parameter to be estimated, and the e_t is an uncorrelated random error with mean zero and variance σ^2.

4.3   Data and Data Sources

The study used quarterly time series data from the period 1993-2015 in analysing the relationship between real exchange rate misalignment and capital flow in Namibia. The data was obtained from the Bank of Namibia and World Bank websites.

CHAPTER FIVE: EMPIRICAL FINDINGS AND ANALYSIS

5.1 Introduction

This chapter presents the detailed empirical analysis and interprets the results of the study. The chapter is divided into seven sections. Section 5.2 documented the results of unit root test. Section 5.3 discussed the results obtained from the long-run coefficient using the ARDL approach. Section 5.4 analysed the results of the co-integration test. Section 5.5 discussed the results of the error correction model. Section 5.6 discussed the results from the diagnostic and stability test. The last section 5.7 presented the results from estimating the inflexion point of misalignment using ordinary least squares.

5.2 Unit Root Test

Prior to time series analysis, the unit root test was conducted by employing the Phillips-Perron (PP) and Kwiatkowski Phillips-Schmidt-Shin (KPSS) test to determine the order of integration of the variables and to avoid spurious results. The test further examined whether the variables were stationary or not. The test results assisted in determining whether or not to use the ARDL model.

Table 5.1: Unit Root Test (PP and KPSS) results

Variable	Model Specification	PP	KPSS	PP	KPSS	Order of Integration
		Levels	Levels	First difference	First difference	
LNTOT	Intercept	-1.759	1.143	-3.798**	0.136**	I(1)
	Trend and intercept	-2.121	0.133**	-3.833**	0.046**	I(0)
LNREER	Intercept	-2.593*	0.438**	-9.259**	0.148**	I(0)
	Trend and intercept	-2.492	0.214***	-9.308**	0.075**	I(0)
LNINF	Intercept	-2.023	0.509***	-6.430**	0.034**	I(0)
	Trend and intercept	-2.476	0.056**	-6.392**	0.031**	I(0)
LNGDP	Intercept	2.153	1.249	-3.911**	0.479***	I(1)
	Trend and intercept	-2.778	0.214***	-4.082**	0.097**	I(0)
ID	Intercept	-3.584**	0.296**	-15.770**	0.326**	I(0)
	Trend and intercept	-3.438*	0.255	-19.994**	0.396	I(1)
CF	Intercept	-11.643**	0.367**	-24.366**	0.371**	I(0)
	Trend and	-11.736**	0.088**	-24.495**	0.259	I(0)

	intercept					
MI	Intercept	-8.933[**]	0.0979[**]	-81.934[**]	0.500[***]	I(0)
	Trend and intercept	-8.885[**]	0.0937[**]	-82.923[**]	0.500	I(0)

Source: Author's compilation using E-views a) Note: ***, ** and * means the variable is stationary at 1%, 5% and 10% level of significance respectively. However, when the variable is stationary at all levels of significance, 5% is chosen.

The results of table 5.1 revealed a combination of a mixture of order of integration for the different variables. For this reason, the ARDL bound test approach was used for the co-integration of the model. The results also revealed that most variables are stationary in levels when using the KPSS test and stationary after differencing when using the PP test.

5.3 Long run coefficient using ARDL approach

Table 5.2: Long run coefficient using ARDL approach (1, 0, 0, 0, 0, 0, 0)

Dependent variable: CF

Variables	Coefficient	t-Statistics	Prob.
LNTOT	1159.740	0.697583	0.4874
LNREER	-564.9407	-1.183271	0.2401
LNINF	305.5606	1.152044	0.2526
LNGDP	143.5550	0.152661	0.8790
ID	184.6234	1.300988	0.1969
MI	-0.139765	-0.344228	0.7315
C	-6638.399	-0.386831	0.6999

Source: Author's compilation using E-views

The ARDL estimates for the long-run coefficients indicated that the relationship between LNREER and CF was statistically insignificant and negative; in other words, capital flow in Namibia have been associated with RER depreciation. Similarly, capital flow was negatively and insignificantly associated with the exchange rate misalignment. On the contrary, capital flow was positively associated with GDP, which meant a rise in capital flow led to an increase in GDP. However, this relationship was statistically insignificant. This empirical result was in uniformity with results previously found in research by Ibrahim (2013). Moreover, the results revealed that capital flow was positively and insignificantly associated with the terms of trade, inflation rate and interest rate differential. However, the results obtained for the inflation rate and interest rate differential was inconsistent with theory. Finally, based on the long-run and short-

run model, there was no long-run or short-run relationship between real exchange rate misalignment and capital flow because the coefficient of the misalignment index was statistically insignificant in both the long and short-run model, as indicated in tables 5.2 and 5.4.

5.4   Co-integration test

Table 5.3: Bounds test results

Computed F-statistics: 16.29481*,**,***	Critical value	
	Lower bound	Upper bound
1%	2.88	3.99
5%	2.27	3.28
10%	1.99	2.94

Source: Author's compilation using E-views

The results in Table 5.1 indicated that the variables were integrated of order zero, I(0) and one, I(1). For this reason, ARDL approach was used for the co-integration of the model. The Bounds test is mainly based on the joint F-statistic which its asymptotic distribution is non-standard under the null hypothesis of no co-integration. A maximum lag order of 1 for the conditional ARDL Vector Error Correction model was chosen by using the Akaike information criteria (AIC). From the results, the F-statistics (16.29481) exceeded both the upper and lower bounds critical values at 1%, 5% and 10%, respectively; therefore, the null hypothesis of no co-integration among the variables cannot be rejected. As a result, it can be concluded that a long-run relationship exists among the variables. This study further proceeded with the error correction model.

5.5   Short-run dynamics of capital flow in Namibia

Table 5.4 Error Correction Model results (1, 0, 0, 0, 0, 0, 0)

Variables	Coefficient	t-Statistics	Prob.
D(CF(-1))	-0.835098	-9.211928	0.0000
D(LNTOT)	-2715.240	-0.296566	0.7676
D(LNREER)	-1740.423	-1.381568	0.1709
D(LNINF)	1985.928	2.622792	0.0104
D(LNGDP)	-15828.77	-0.684177	0.4958
D(ID)	89.95539	0.425189	0.6718
D(MI)	-0.498695	-1.091802	0.2782
ECT(-1)	-0.780981	-4.824129	0.0000
C	211.4962	0.769274	0.4440
R^2	0.654470		
Adjusted R^2	0.620344		
F-statistics	19.17782		0.0000
DW	1.502975		

Source: Author's compilation using E-views

The results revealed that interest rate differential and inflation rate have a positive effect on capital flow in the short-run. However, only the inflation rate had a positive significant association with capital flow, moreover, this result was inconsistent with theory. The results further indicated that, REER was negatively and insignificantly related to capital flow. Similarly, the terms of trade and GDP were negatively and insignificantly associated to capital flow; nevertheless, this empirical result is in uniformity with theory.

The lagged error correction coefficient (ECT) carried the expected negative sign and was statistically significant at all levels of significance, indicating that variables may be co-integrated. It indicated the speed at which the short-run dynamics adjusts to the long-run equilibrium. The coefficient of the ECT (-0.780981) also signified complete specifications and a high rate of convergence to equilibrium. R^2 is 0.654470, which meant that 65.4% of the total variance in capital flow has been explained. The Durbin-Watson statistic of 1.502975 implied that the null hypothesis of no autocorrelation in the residual cannot be rejected.

5.6 Diagnostic and Stability Test

Table 5.5 Diagnostic test results

| White Heteroscesdasticity	Chi-square	10.86088	0.2097
Breusch-Godfrey LM test	Chi-square	1.932789	0.3805
Ramsey RESET test	F-statistics	2.939470	0.0903

Source: Author's compilation using E-views

Note: [**] denotes the acceptance of the null hypothesis at 5% level.

Table 5.5 indicated the result of the White Heteroskedasticity (no cross terms) p value of 0.2097 which implied that the null hypothesis of homoskedastic residuals cannot be rejected, in other words, there was no indication of heteroskedasticity. Moreover, the p-values Breusch-Godfrey LM test was above 0.05, which meant that there was no evidence of a diagnostic problem with the model and the residuals were not serially correlated; hence, the null hypothesis of no serial

correlation cannot be rejected. Similarly, the Ramsey RESET test also indicated a p-value higher than 0.05 which suggested that the model was well specified and stable. Hence, the regressions passed all the diagnostic tests against serial correlation, heteroscedasticity, and instability.

Figure 5.1: VAR stability condition results

Inverse Roots of AR Characteristic Polynomial
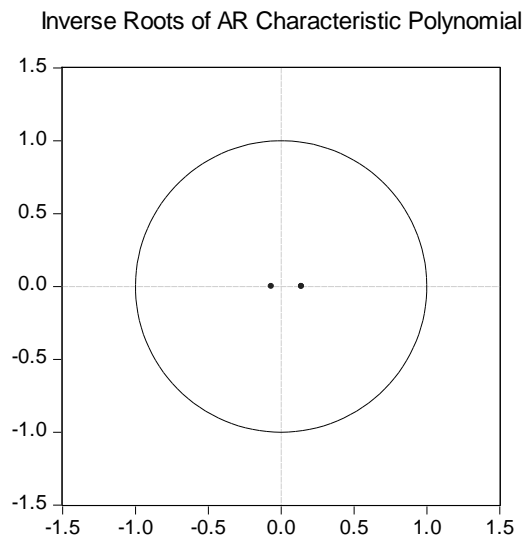
Source: Author's compilation using E-views

The VAR stability test was conducted to test whether the model is stable as reported in Figure 5.1. The results reveal that no roots lie outside the model, therefore, one can conclude that the stability condition of the model is satisfied.

Figure 5.2: Stability test
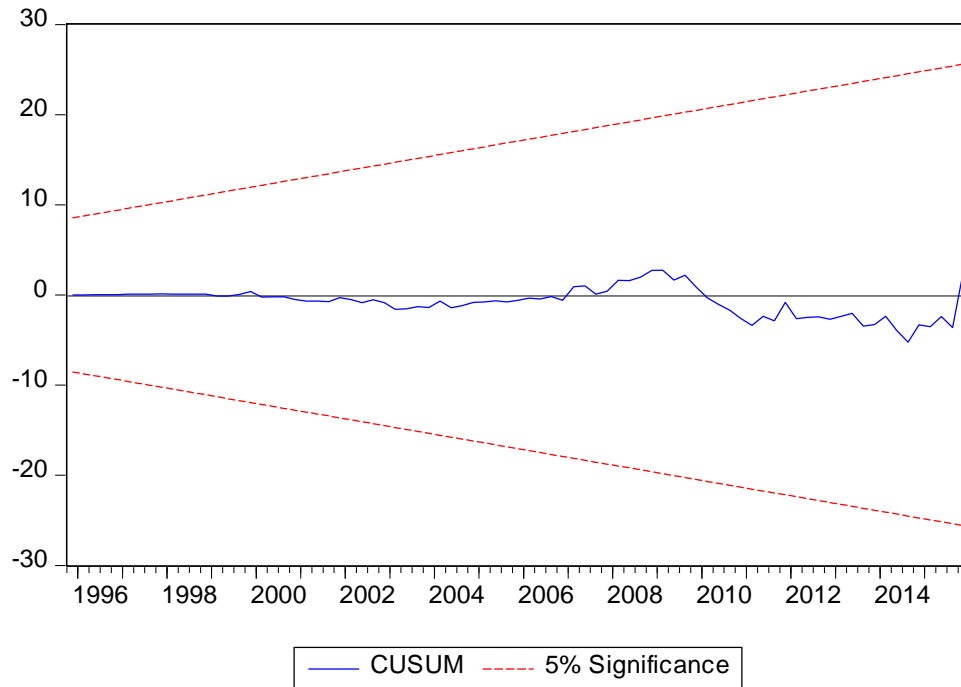
The cumulative sum of recursive residuals (CUSUM) was applied to assess the stability of parameters. The results indicated that the estimated coefficients were stable because the plot of the CUSUM statistic fell inside the critical bands of the 5% confidence interval of parameter stability.

5.7   Estimating the inflexion point of misalignment

$$CF = 332.57 - 1.87MI - 0.001MI^2 + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5.2)$$

$$(0.728) \quad (0.7067)$$

Equation 5.2 showed that an overvaluation and undervaluation have a negative effect on the capital flow. However, the absolute misalignment coefficient (0.7067) proved to be statistically insignificant as indicated by the p-values in parenthesis, which were all above 0.05. This implied that the divergence of the real exchange rate from its equilibrium value does not play a role in explaining capital flow. The negative effect of exchange rate misalignment on capital flows was

consistent with the results found by Sidek et al (2009) and Ng'ambi (2015). Gouider & Nouira (2011) noted that this could be explained by the fact that the investors take into account factors such as corruption, the ratio of the foreign debt in the GDP, the low growth rate of the GDP, the increase of tax and inflation which increase the risk and uncertainty other than the misalignment of the real exchange rate.

CHAPTER SIX: CONCLUSION AND POLICY RECOMMENDATIONS

6.1   Introduction

In the previous chapter, the results were presented and analysed. In this chapter, the findings of the study are outlined. The chapter consists of three sections: section 6.2 outlines the overall conclusions of the study while section 6.3 presents the recommendations based on the findings.

6.2   General conclusion of the study

The real exchange rate (RER) is considered as one of the determinants for capital flow; it is also an important measure of the competitiveness of an economy. The objective of this study was to estimate the equilibrium real exchange rate and the resulting real exchange rate misalignment, and then test the impact of misalignment on capital flows in Namibia. The capital flow was determined by the terms of trade, gross domestic product, inflation rate, real exchange rate and interest rate differential. The estimations were conducted on the quarterly data on the Namibian economy from 1993Q1–2015Q4. The study employed the unit root test, error correction method and the Bounds test to co-integration method to analyse the relationship between the variables.

The autoregressive distributed lag (ARDL) approach to co-integration was also used to examine the relationship between RER and other macroeconomic fundamentals. This estimation procedure has the advantage that it allows for a mixture of explanatory variables which are integrated of different order and at the same time it provides consistent estimates for small samples.

The most significant findings of the research were that the inflation rate had a statistically insignificant and negative relationship with capital flow in the long-run, however, in the short-run it proved to have a positive and significant association with capital flow. Moreover, the results revealed that the real exchange rate and gross domestic product was insignificantly

associated with capital flow in the long-run and short-run. The findings further revealed that terms of trade have a positive effect on REER, which proves to be statistically significant. This could imply that the substitution effect is stronger than the income effect in the RER movement. On the other hand, interest rate differential had a positive and statistically insignificant association with LNREER. Moreover, the results indicate that exchange rate misalignment has a negative effect on the capital flow. However, the absolute misalignment coefficient proves to be statistically insignificant.

6.3   Policy recommendations of the study

Given the overall objective of this research, many policy implications can be drawn from the findings to help guide economic policy. First and foremost, policy makers should consider efforts in terms of improving the exchange rate, so as to promote the competitiveness of commodities and to create a conducive investment environment which will attract foreign investors. Real exchange rate depreciation that arises from negative terms of trade shock that reduces the demand for exports and in turn reduces aggregate demand would require an expansionary monetary policy. Moreover, these policy responses are less likely to be inflationary.

It is vital to note that Namibia has witnessed the fleeing of substantive capital, as such, designing policy to curb the problem of capital flow would require not only a focus on policies aimed at reducing capital flow, but also a strong emphasis on inducing the repatriation of private capital held abroad. The persistence of capital outflow in Namibia tend to be in favour of South Africa due to their most sophisticated financial markets within the CMA arrangement. Therefore, the focus of policy reforms should also be on creating an investment-friendly environment to attract foreign capital and encourage domestic investment.

The findings of the study suggest that there might be a negative relationship between capital flow and exchange rate misalignment. The exchange rate is also one of the factors that investors take into account when making investment decisions. Therefore, there is a need for effective management of the real exchange rate misalignment. Moreover, Ng'ami (2015) argued that government could also place restrictions on capital outflow during distress periods as well as controls on short term portfolio funds injected into the economy that can be easily pulled out, in an effort to reduce the effect on the exchange rate. Additionally, the government could diversify its financial instrument and derivatives to hedge against real exchange rate misalignment and therefore increase investors' confidence, thereby increasing capital flow.

6.4   Area of future research

The results reveal that although exchange rate misalignment has a negative impact on capital flow, its effect is not significant. According to economic theory, although exchange rate misalignment is a serious problem in most countries, only a significant appreciation or depreciation has a detrimental impact on capital flow. Therefore, this study suggests future research on estimating a precise threshold value to determine to which extent exchange rate misalignment deters capital flows in Namibia.

This study was further limited to a number of selected macroeconomic variables in determining the real exchange rate in Namibia. Moreover, it focused on assessing the impact of real exchange rate misalignment on capital flow, whereas this may not be the only factor affecting capital flow; as a result, these variables may not be sufficient or able to accurately explain changes in capital flow.

The study is limited to the Namibian economy and as a consequence, the results obtained may not be applicable to other countries. Therefore, future empirical work can be extended to other countries to evaluate the variations of how exchange rate misalignment impacts capital flows.

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