# AN INVESTIGATION OF THE RELATIONSHIP BETWEEN GROSS DOMESTIC SAVING AND INTEREST RATE IN NAMIBIA

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**ABSTRACT**

The main objective of the study was to investigate the relationship between gross domestic savings and the interest rate in Namibia. It should be pointed out that the interest rate was subsumed by the repo rate. This objective is divided into two sections, namely to investigate the short and long run relationship and to test for causality between the gross domestic savings and the repo rate. The study used annual time series for the period 1981 to 2017 to test for the relationship between the stated variables using Gross Domestic Savings (GDS) as a percentage of Gross Domestic Product (GDP) investment as a percentage of GDP and the repo rate in Namibia. The Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) were applied when testing for stationarity. It was found that all the series were non-stationary at levels but stationary at first difference. The Johansen cointegration test was also applied to test for a long run relationship between variables. The results show an existence of a long-run relationship between gross domestic savings and the repo rate. Furthermore, it was found that investment is not cointegrated with any of the two variables. Using the Vector Error Correction Model (VECM), the study found a short run relationship between the variables and as such the error term corrects for disequilibrium in the variables. Through the VECM the study also tested for causality, impulse response and variance decomposition. The study found no causality between GDS, repo rate and investment from any direction. These findings are contrary to existing literature; the classical and neoclassical school of thought. The deviation in the findings from the existing literature could be attributable to the high capital mobility as found in Namibia, as well as the currency peg arrangement, (Uanguta, et al., 2004). The main recommendation from this study is that the adjustment of the repo rate (monetary policy), as a remedial tool for a declining GDS should be accompanied by other savings promoting policies (lucrative investment vehicles) and incentives (increase in income, positive credit scores for saving households) to achieve the intended purpose.

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**List of Abbreviations and/or Acronyms**

| | |
|---|---|
| ADF | Augmented Dickey-Fuller |
| AIH | Absolute Income Hypothesis |
| APC | Average Propensity to Consume |
| ARDL | Autoregressive Distributed Lagged Model |
| BoN | Bank of Namibia |
| CMA | Common Monetary Area |
| FDI | Foreign Direct Investment |
| GDP | Gross Domestic Product |
| GDS | Gross Domestic Savings |
| IMF | International Monetary Fund |
| LCH | Life-cycle Hypothesis |
| MPC | Marginal Propensity to Consume |
| MPS | Marginal Propensity to Save |
| NSA | Namibia Statistics Agency |
| NFSS | Namibia Financial Sector Strategy |
| PIH | Permanent Income Hypothesis |
| RIH | Relative Income Hypothesis |
| VAR | Vector Autoregressive Model |
| VECM | Vector Error Correction Model |
| WIBAR | Windhoek InterBank Agreed Rate |

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## DEDICATION

I dedicate this thesis to my husband, Shaun Kahimise for his love and support which made this journey bearable, as well as my children. With you by my side, there is no limit to what I can accomplish.

**DECLARATIONS**

I, Veripamue Tjiho, hereby declare that this study is my own work and is a true reflection of my research and that this work or any part thereof has not been submitted for a degree at any other institution.



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**Name of Student Signature** **Date**

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

A country's economic progress depends largely on its ability to mobilize the necessary savings to finance capital formation in order to increase the rate of economic growth and development, (Arok, 2014). Generally, saving is defined as the positive difference between income and expenditure. From the Keynesian consumption theory point of view, saving is regarded as the number of resources put aside for future consumption (saving is postponed consumption), (Keynes, 1946). Al-Afeef and Al-Quad, (2015) define saving as follow; "Saving means different things to different people, to some it means putting money in the bank. To others, it means buying stocks or contributing to a pension plan. But to economists, saving means only one thing: consuming less in the present in order to consume more in the future".

Saving is usually accumulated during times of access and is used to shield individuals, households, or firms from future uncertainty. In line with the Life-Cycle Hypothesis (LCH), saving is lower during earlier years and plentiful in the later years of an individual's life, (Friedman, 1957). Therefore, implying that saving is not only dependent on current income but on future income expectations as well.

The interest rate is one of the macroeconomic factors that are used to explain changes in gross domestic savings in the economy (Arok, 2014). An interest rate is broadly defined as the fee charged on the amount borrowed, lend or deposited, expressed as a percentage of the total amount of the loan or deposit, (The Banking

Association South Africa, 2018). The South Africa Reserve Bank defines interest rate as is the remuneration or price to capital invested, lent out or borrowed for various periods of time. Interest rates for credit card, loans, or mortgages are charged on an annual basis and are referred to as annual percentage rate. While interest rate earned by consumers for savings and investment is expressed as an annual percentage yield, (The Banking Association South Africa, 2018). According to the theory of interest by Irving Fischer (1930) interest rate are defined as an index of the community's preference for a present value of dollar over a dollar of future income from the value of a dollar.

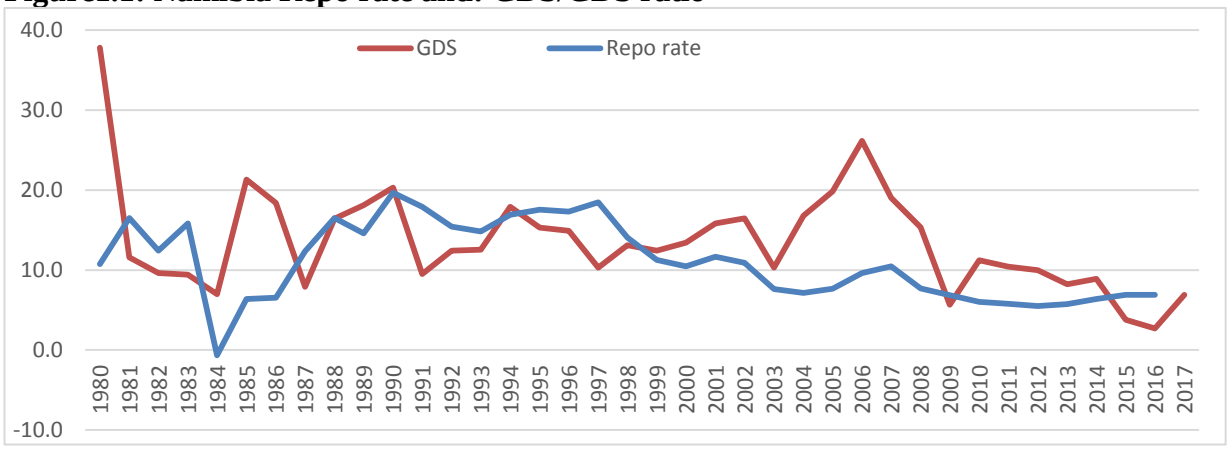
There are several interest rates charged by financial institutions in the Namibian economy, namely the repo rate, Windhoek Interbank Agreed Rate (WIBAR), prime rate, lending rate, and real interest rate, (Bank of Namibia, 2016). The Bank of Namibia (BoN) uses the repo rate as a monetary instrument to adjust interest rates in the Namibian economy. The BoN also uses this interest rate (in line with the repo rate by the South African Reserve Bank) as the rate charged to commercial banks in Namibia for borrowing from the Central bank, (Samahiya & Kaakunga, 2014).

The Windhoek Interbank Agreed Rate (WIBAR) is the interest rate which is charged to commercial banks for interbank borrowing; the prime rate is the benchmark interest rate and also the rate of interest charged for loans made to the commercial bank's most credit-worthy business and industrial customers; lending rate refers to the weighted average lending rates charged by each bank; real interest rate is the rate of interest adjusted to allow for inflation and is measured as the nominal interest rate less the rate of inflation for Namibia, (Bank of Namibia, 2016).

Based on most investment theories and as alluded to by Eita (2013) and Nghifenwa, (2009), domestic saving is one of the main determinants of domestic investment. In addition, there is a negative relationship between investment and interest rates and as such implying a positive relationship between savings and interest rates. The implied relationship stems from the classical and neoclassical theory of consumption. In line with the neoclassic and Classical School of thought, savings and investment are equal at full employment, whereas the Keynesian School of thought equates the two at several levels of potential output and equilibrium is only one point at full employment. Ogbokor and Musilika, (2014) conform to the classical school of thought, which argues that through changes in interest rates, saving causes investment and thus savings determines interest rates.

In 2014, the BoN increased the repo rate from 5. 50 percent to 5.75 percent, after a 5-year period of below average rate at 6 percent of repo rate. The BoN implemented this policy decision with the notion of reducing household indebtedness, reducing the import bill and to promote savings. The policy decision was based on the classical theory which implies a positive relationship between interest rates and domestic savings, figure 1.1, (Bank of Namibia, 2014). Long term domestic savings leads to an accumulation of resources in an economy, which can then be channelled through financial institutions to stimulate economic activities which in turn trigger economic growth, (Zamuee, 2015).

**Figure1.1: Namibia Repo rate and: GDS/GDS ratio**




Source: Bank of Namibia and NSA (2017)

Namibia is a member of the Common Monetary Area (CMA since 1992, and the currency (Namibian Dollar) is pegged at par value with the South African Rand. Members of the CMA are Namibia, Lesotho, Swaziland, and South Africa, with South Africa being the largest economy in the group, (Wang, at el., 2007). This means that Namibia, by implication, has limited monetary control and as such cannot carelessly use the repo rate as a monetary policy instrument to influence (counter or pro-cyclical policy intervention) the performance of the economy. As such, this means that the repo rate in Namibia should be the same as in South Africa, although BoN has some discretionary tools to use in consideration of certain needs such as capital and prudential controls for financial institutions in Namibia, (Bank of Namibia, 2014).

Namibia is classified as an upper middle-income country by the World Bank since 2009; this classification has created some developmental constraints to the Namibian economy. As public debt has risen above government set targets of 35 percent to 42 percent in 2017, economic growth has contracted by 0,90 percent, far below the NDP

5 target of 5percent, the current account deficit is at 2 percent of GDP, (Namibia Statistics Agency, 2018).

Investment in Namibia is heavily dependent on foreign direct investment (FDI), which is highly volatile and is mostly driven by the extractive industry. Domestic savings are assumed to have a positive impact on economic growth through the investment of the accumulated resources available in the economy (Ogbokor & Samahiya, 2014). The study by Ogbokor and Musilika, (2014**)** which investigated the relationship between aggregate savings and investment in Namibia found a unidirectional causality running from savings to investment.

This simply means that in Namibia aggregate savings causes investment and therefore, an increase in savings will lead to an increase in investment. Figure 1.1, illustrates the dire situation such that GDS/GDP ratio is currently in negative territory and as such means that the economy is dissaving, (Namibia Statistics Agency, 2018). Therefore, it is imperative that Namibia focuses on promoting domestic savings to create excess funds for investment in the economy and reduce the dependency on FDI and debt financing.

## 1.2 Statement of the problem

Namibia has previously been a saving exporting nation (of which most are contractual savings from insurance to pension funds) which is evident in the financial outflows (for both portfolio and direct investment) that are recorded in the balance of payments under the BoN, (Nghifenwa, 2009). The gross domestic savings (GDS) to gross domestic product (GDP) ratio has been declining since independence,

averaging at 9.5 percent over the last decade compared to an average of 15 percent over the earlier two decades, (figure 1.1) (Namibia Statistics Agency, 2018).

The decline is mostly due to the fact that large portions of the domestic saving derived from contractual obligations are accumulated by pension funds and insurance institutions. These institutions export the domestic savings for investment out of the country for higher investment yields. The high rate of domestic funds exportation can be attributed to the fact that Namibia lacks sufficient and profitable investment instruments, Zamuee, (2015) and Uanguta, et al., (2004). Although the adoption and implementation of the Namibia Financial Sector Strategy (NFSS) 2011, is aimed at addressing the short coming of the Namibian financial sector, progress is still lacking behind, evident by the negative GDS/GDP ratio in figure 1.2.

As a member of the CMA, pension funds and other savings and investment institutions in Namibia enjoy access to the luxuries of an integrated fully developed and sophisticated financial market available in South Africa and this promotes the high capital mobility, (Uanguta et al., 2004). A high outflow of funds (domestic savings) for better yields elsewhere has been recorded over the post-independence period, (Uanguta, et al., 2004). Capital mobility is relatively high especially from Namibia to South Africa, despite the fact that both Namibian and South African currencies have the same value and interest rate should be the same, this remains a developmental concern for Namibia.

According to Ogbokor & Musilika, (2014), the Namibian data reflects no long-run relationship between savings and investment; this is due to high capital mobility

which is suspected to have caused disequilibrium between savings and investment in Namibia. These findings imply a contradiction of the classical school of thought as well as the Keynesian school of thought, which support the notion of a long run relationship between savings and investment. The classical economist, argue that current savings form a pool of funds that contribute to availability of funds for future investment.

The relationship between interest rates and interest rates in Namibia has limited literature available and creates a literature gab in understanding the lead cause of high capital outflow as well as how changes in interest rates affect savings in Namibia. The high capital mobility and the relationship between interest rates in Namibia and South Africa suggests the need to investigate the relationship between gross domestic savings (GDS) and interest rates, in order to find possible solutions to promoting savings in Namibia.

## 1.3 Objectives of the study

The main objective is to determine the relationship between GDS and interest rates in Namibia.

The following are the specific objectives:

- To determine the short and long-run relationship between GDS and interest rates
- To investigate the direction of causality between GDS and interest rate in Namibia.

## 1.4 Hypotheses of the study

$H_0$: There is no short and long-run relationship between GDS and Interest rate

$H_1$: There is a short and long-run relationship between GDS and Interest rate

$H_0$: There is no causality between GDS and interest rates

$H_1$: There is causality between GDS and interest rates

## 1.5 The significance of the study

The study will provide more knowledge to the current body of literature on the short and long-run relationship between GDS and interest rate in Namibia. The study suggests policy recommendation to policy decision making authorities for the promotion of domestic saving in line with the goals of promoting economic growth which in turn might impact of poverty reduction in Namibia.

## 1.6 Limitation

This study has focused on ascertaining whether or not there is an existence of short and long-run relationships between GDS and interest rates in Namibia by looking at the following variables: repo rate in Namibia, gross domestic savings and investments as percent of GDP. Due to data limitations, the repo rate was chosen to represent interest rates as it is the basis of all interest rates in the country; the repo rate for the period 1980-1990 was derived from existing real prime lending rates in South Africa and inflation. The repo rate was derived in line with Fishers' theory of interest as, cited by (Eita, 2013) and validated as such because Namibia was under the South African rule and was treated as a $5^{th}$ Province of South Africa prior to 1990.

## 1.7 Delimitations of the study

The study used secondary time series data in the attempt of achieving the objectives of the study, time series data is good for trend and regression analysis. The variables repo rate, gross domestic savings and investment as a percentage of GDP was chosen to best achieve the objectives of the study without creating multi-collinearity complications in the study.

## 1.8 Outline of the study

Chapter One introduces the topic with a background of the study, the problem statement, objectives; the hypotheses that were to be tested; significance, the limitations, as well as and delimitations of the study. The remainder of the paper is divided into four chapters. Chapter Two provides an overview of the theoretical and empirical literature related to the study. Chapter Three presents the methodology adopted in this study, while chapter four covers the results and discussion of the empirical results derived from the quantitative methods employed in the study. Chapter Five deals with the conclusions and recommendations made from the findings of the study.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 Theoretical Literature

### 2.1.1 The Life-Cycle Income Hypothesis (LCIH)

The LCIH was developed by Modigliani in 1954, an attempt to describe individual consumption behaviour in the 1950s. The LCIH states that an individual plans their consumption and saving patterns throughout their lifetime. This means that an individual starts out with a dissaving because they depend on their parents, once they start attaining an income than they start saving, (Modigliani, 2005). The saving continues to increase throughout their working life and stops at retirement, after which they start consuming the savings to maintain the attained level of consumption (consumption smoothing). According to this theory, the level of savings for an individual is small when they are young and high as they get old and reach retirement, as depicted in figure 3. The dependency ratio has an impact on the level of saving that an individual can accumulate and hence the lower savings in developing economies because the dependency ratio is higher than the developed economies where the dependency ratio is low and saving is high, (Arok, 2014).

Figure 2.1: Life-cycle Income Hypothesis- (Arok, 2014)

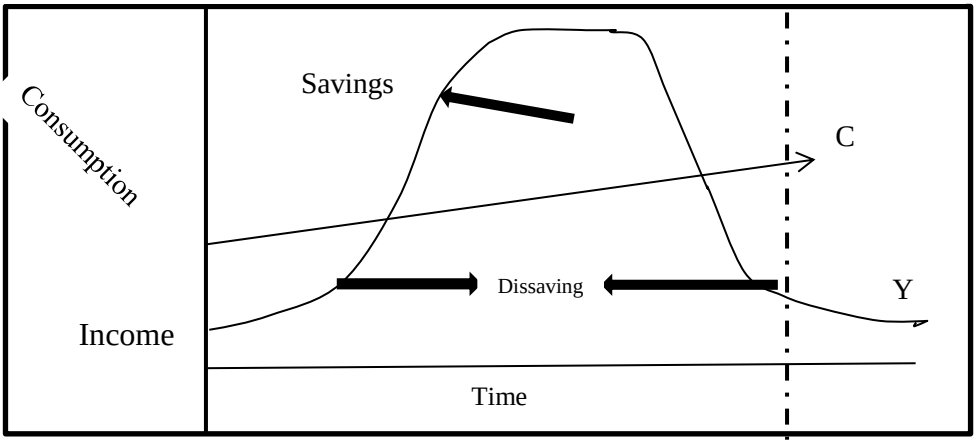


Figure 2.1 above, indicates an illustration that, there are three periods (phases) in an individual's life, phase one is when an individual is dependent and consumes without an income: Phase two, when the individual becomes economically active and earns an income and is actively accumulating wealth and: Phase three, when the individual retires and starts living off of the accumulated wealth. Phase one and three are the dissaving phases while phase two is when the individual accumulates their wealth. This hypothesis is based on microeconomic foundations and assumes that if everyone behaves the same than the overall conclusion would be the same.

### 2.1.2 The Permanent Income Hypothesis (PIH)

PIH assumes consumption to depend on current/transitory income as well as the permanent income components. Transitory income is current income that an individual is receiving while permanent income is regarded as the expected average long-run income over the lifespan of the individual, (Friedman, 1957). This theory was a departure from the Keynesian's theory on absolute income hypothesis and demand management techniques due to the empirical invalidity of the assumption of a constant marginal propensity to consume or save. The PIH states that any increase in current income would initially be treated as transitory and as such the individual would not increase their consumption immediately until the individual establishes that an income increase is permanent. The increase in income would take some time to fully affect the consumption levels and therefore creates a lagged effect between income increases and change in consumption levels, (Schenk, 2013).

$$Y = Yc + Yp, \qquad Yc = transitory\ income, and\ Yp = permanent\ income$$

$C = Cp + Ct,\ Cp = permanent\ consumption\ and\ Ct = transitory\ consumption$ . (1)

⇨ $S = Yp - Yt$……(2)

An individual will only save if the current income is higher than the anticipated level of permanent income, in order to guard their consumption against future declines in income, as indicated by equation 1. Saving is used as a mechanism to smoothen consumption over a consumer's lifespan. It is assumed that MPC declines as income increases and that MPC is lower in businesses than in households, hence businesses tend to have a higher MPS compared to households. Given the dynamics of economics and depending on the integration of different economies, there are other factors that affect an individual's saving rate, such as; previous levels of income, their age, asset holdings, consumption behaviour, dependency ratio, etc., Friedman, (1957).

### 2.1.3 Absolute Income Hypothesis (AIH)

According to the Absolute Income Hypothesis (AIH) by Keynes, (1946) consumption and saving are positively related to current disposable income. However, it should be noted that this theory was based on the fundamentals of the law of psychology and not on any empirical evidence. The AIH further states that consumption and saving are non- constant proportions of current disposable income, such that marginal propensity to consume (MPC) and marginal propensity to save (MPS) are less than 1 (MPC<1 and MPS<1 or MPC+MPS=1). Average propensity consume (APC) is equal to total consumption divided by total disposable income and it varies with disposable income varies (C/Y). Equation 3 to 6 illustrates the above-stated relationships (Nangula, 2014).

$Yd = C + S$…….. (3)

$C = a + bYd$…… (4)

$S = Yd - C$…….

$S = \alpha Yd - C$……. …….. (5)

$$MPS = \alpha = 1 - \frac{\partial C}{\partial Yd} \ldots\ldots\ldots\ldots \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Another feature of the AIH is that APC is falling as income rises and is greater than MPC ($\frac{\partial APC}{\partial Y} < 0 \; as \; dY > 0 \; and \; APC > MPC$). However, empirical evidence by (Kuznets 1946 as cited in (Alimi, 2013)) shows that the AIH only applies to the short run consumption function and are inconsistent with long-run data on the consumption function. According to Kuznets, (1946) the empirical data indicated that there was no constant term to the consumption function and as such $a = 0$ and MPC=APC in the long run.

### 2.1.4 The Relative Income Hypothesis

The relative income hypothesis (RIH) developed by Duesenberry, (1949) states that an individual's behaviour on consumption and saving is determined more by their income in relation to others than the absolute value of the income. It also states that the APC of an individual depends on their position within the income distribution level. Therefore, at the aggregate level, the APC is relatively constant because a household with lower income have a high APC and households with higher income have a low APC. This is seen as reducing the gap in living standards. The fact that consumption or savings are not necessarily dependent on the absolute value of income but rather on the social standing means that aggregate savings are independent to aggregate income.

The RIH also hypothesizes that the present consumption is influenced not purely by present levels of absolute and relative income, but also by past levels of consumption attained in the previous period. It is difficult to reduce the level of consumption once attained. According to this hypothesis, in the short run APC > MPC while, in the long run, APC = MPC. In addition, this theory concludes that the propensity to save of an individual is an increasing function of their income.

### 2.1.5 Classical Economic Theory on Consumption

The classical economic theory is based on a fundamental principle of a self-regulating economy that it is always producing at the natural level of real GDP/output. Hutt, (1975) explained the notion of the economy operating at or near full capacity is based on Say's Law and the belief that prices, wages, and interest rates are flexible. According to Say's Law, when an economy produces a certain level of real GDP, it also generates the income needed to purchase that level of real GDP (implying that demand is always equal to supply). Initially, the classical theory did not take savings into account, as the assumption was that the sole reason for production was consumption. And the sole reason for money was as a medium of exchange and that money in itself was not a commodity to be held. However, with the advancement of the consumption theory by Keynes, adjustments were made to the underlying assumptions to the classical theory by (Hutt, 1975). The RIH was developed as an approach in an attempt to rectify the shortcomings of the Keynesian theory on consumption which was based on cross-sectional data by using both time series and cross-sectional data.

The assumption of flexible interest rates, wages, and prices prompted classical economists to believe that the flexibility of interest rate as well as prices to be the self-adjusting mechanism of classical theory which ensures that real GDP is always at its natural level, (Hutt, 1975). Although at times aggregative saving will be higher than the needed funds for borrowing, interest rates will adjust themselves to lower levels to discourage savings. As such reduce aggregate savings and promote spending and thus raise the level of output to full capacity. Say's Law proves that there is a positive relationship between saving and interest rates in an economy.

### 2.1.6 The Monetarist

The Monetarist view the economy as based on money supply and that variation in the money supply leads to a variation in economic activity. Monetary economics is mainly concerned with the relationship between inflation, interest rate, and money supply. The monetary economics is fundamentally based on the principle: MV=PQ, where M is money supply, V is the velocity of money in the economy, P is prices and Q is the output in the economy, (Welsh, 2010).

The quantity theory of money was modernised by Fisher (1930), using the monetary principle and getting to MV=PT, where M stands for money stocks; V stands for velocity; P stands for price levels and T is the total volume of transactions. Fishers' theory of interest (1930) differentiates between real and nominal interest rates, where real interest rate equals nominal interest rates less expected inflation, (Shifotoka, 2015). Fisher opposed conventional taxation as he reckoned that taxation had a negative impact on savings and that those who saved and invested experienced double taxation; firstly, from their initial income and; secondly, from the proceeds of

their investment. Fisher's theory proposed that to increase savings, consumption taxation should rather be increased instead of tampering with interest rates, (Econlib, 2017).

Based on the Monetarist view by Friedman (1987), interest rates are determined by the following factor: Central Bank rates (repo rate in Namibia), demand for notes and bonds in a country and banking industry. The different types of interest rates in Namibia are as follows: Repo rate (what BoN charges commercial Banks); WIBAR (Windhoek Interbank Agreed Rate); Prime rate (The rate of interest charged for loans made to its most credit-worthy business and industrial customers); lending rate (The lending rate refers to the weighted average lending rate); real interest rate (The rate of interest adjusted to allow for inflation; the nominal interest rate less the rate of inflation for Namibia ), Bank of Namibia (2016).

## 2.2 Empirical Literature

Ogbokor and Simahiya, (2014) investigated the determinants of savings in Namibia using quarterly extrapolated annual data. The study used co-integration and Vector Error Correction Mechanism (VECM) mechanisms for the period running from 1991 to 2012. The study found a positive long-run relationship between savings, inflation, and income; while the relationship between savings and population growth rate is negative (a higher population growth means a higher dependency ratio). However, the study found that the deposit rate and financial deepening have no significant effect on savings. The latter findings reflect a contradiction to economic theory and can be attributed by the data used (annual data manipulated to reflect quarterly data)

and the period reviewed was rather short (1991-2012). The main recommendation of this study is to implement policies that would promote savings through improved income levels in Namibia.

According to the investigation of the relationship between aggregate savings and investment in Namibia by Ogbokor and Musilika (2014), there is no long-run relationship between the two variables, possibly due to the high capital mobility that occurs in the Namibian economy. The study also found a unidirectional causal relationship running from savings to investment, in line with the classical and neoclassical theory on the said relationship. The study used the Johansen cointegration test, the VECM, and Granger causality model to perform econometric testing of the data for the period 1995- 2011. The study also concluded that high capital mobility implies that investment in Namibia is mainly driven by foreign direct investment. Possibly a high level of consumption in the Namibian economy which causes a current account deficit might be the cause of no cointegration between savings and investment. Given the unidirectional relationship running from savings to investment, the study recommends and calls for savings promoting policies and the development of the financial sector by authorities.

Nghifenwa (2009) studied the factors influencing investment in Namibia, states that accumulated domestic savings can be used for investment or promotes investment and contributes positively to economic growth. The study employed the OLS methods, co-integration, and the error-correction model for analysis of data, using annual data from 1970 to 2006, to study the determinants of investment in Namibia. The study found that savings serves as a source of funds for investment and has a

positive impact both on the short and long run on investment in Namibia. The study also found that GDP and post-independence investment incentives had a positive impact on investment while, interest rate had a negative and strong impact on investment. The study recommended a strategic approach from the government on investment promoting incentives especially in the technology and entrepreneurial sector.

Eita (2013) analysed the determinants of investment in Namibia for the period 1971-2010. The study used the neo-classical model and analysed the data using co-integration, Engle-Granger two-step estimation, and the augmented Dickey-Fuller (ADF) methods. However, the conclusions of this study are slightly deviating from the study by Nghifenwa (2009), that savings has a positive impact on investment but is not a sufficient condition for investment in Namibia. Eita (2013) also found a positive relationship between investment, GDP, the openness of the economy and financial development. On the other hand, the study found a negative but strong correlation between investment and user cost of capital (interest rates) – this is consistent with existing literature. The deviation in findings of the studies by Eita (2013) and Nghifenwa (2009) can be attributed to the different variables studied by both researchers with only investment, and savings as being the only identical variables. Although both studies used data for the same period, the tools for data analysis and methodologies were also different.

The study on the causality between lending interest rates and credit availability to households in Namibia by Kalumbu & Nyambe (2015), concluded that there is a one-direction positive relationship between lending interest rates and credit

availability to households in Namibia. The relationship, moves from credit availability to lending interest, thereby credit availability explains lending interest rates in Namibia. The study employed the methods of unit roots, Johannsen co-integration, Granger causality, and impulse response tests to analyse the data used (monthly data for the period, 2000-2012). The study, therefore, cautioned the exercise of adjusting lending rates (monetary policy repo rate) to maintain stable prices in the country as it might cause distortion in the money market and unintentionally increasing lending rates. The conclusion of this study is concurrent with the view on the study on the determinants of mortgage rates in Namibia by Ogbokor and Kweddi (2014).

Jagadeesh (2015) undertook an investigation of savings impact on economic growth in Botswana and found a positive strong correlation between gross domestic savings (GDS) and GDP. The research paper also concluded that savings are positively and indirectly related to economic growth (GDP) in Botswana during the period 1980-2013. The study used the Harrod-Domar growth model to evaluate the impact of savings on Gross Domestic Product and used the test of stationarity, co-integration, and the Auto Regressive Distributed Lagged model (ARDL) to analyse the time series of Botswana. The study also affirmed the Harrod-Domar growth model being applicable to Botswana's economy. The study recommends saving promoting incentives and policies to enhance domestic savings as a mechanism to promote economic growth through productive investments. Another recommendation from the study is the promotion of export, to increase the country's foreign reserves.

When Ogbokor and Kwedhi (2014) studied the factors that influence the behaviour of mortgage rates in Namibia, they found that 68 percent of variations in mortgage rates are explained by the repo rates, real interest rates, and risk premium. However, the influences from the repo rates were stronger with a long run relationship between the two variables being emphasised. The study employed the methods of ADF to test for unit roots and determine the stationarity of the data and the Johansen co-integration was used to test for co-integration between the variables and establish the long run relationship between the explanatory and independent variables. The Granger causality method was applied to determine the direction of causality between the variables. Due to the presence of cointegration, the Vector Error Correction Model (VECM) was used to estimate the relationship between the mortgage rates and interest rates. The study concluded that BoN can use the repo rate to influence and monitor the money market effectively and efficiently.

In 2015 Shifotoka studied the relationship between bank rate, unemployment, and inflation as a case study of the Philips curve in Namibia. The study used data from the period 1961-2012 in Namibia, the data were tested for unit roots using ADF and PP methods and Johannsen co-integration test for long-run relationship testing; finally, the short run relationship was estimated using the VECM. The data was also tested for Granger causality and the impulse responses were applied to the data. The findings are as follows; the variations for inflation and unemployment were explained by the bank rate and that inflation and unemployment are inversely related, hence proving the Phillips curve to be applicable in Namibia. The findings of this study are consistent with the literature and conform to the study by Kunst (2011) done on the USA economy. The main recommendation from this study is that the

monetary and fiscal authorities can use the bank rate to address the twin evil of inflation and unemployment.

Al-Afeef and Al-Qudah (2015) found a positive and long-run relationship between savings and investment in the Jordanian economy when they studied the causality between savings and investment in Jordan over the period from 1980-2013. The study also found a long run relationship between GDP, FDI, and savings; however, the relationship between savings and FDI was negative, which is consistent with the existing theory to date. They used ADF and Johansen co-integration method for the data analysis, given that there was a co-integration presence in the data, the study estimated the VECM. The main recommendations from this study were the better development of the Jordanian banking and financial sector, to better enhance capital accumulation and reduce capital mobility.

Arok (2014) found no significant relationship between interest rates and gross domestic savings or with technological advancement and the dependency ratio in Kenya, while the impact of GDP growth and inflation were significant. The study by Arok (2014) set out to determine the factors affecting the growth of gross domestic savings in Kenya using annual time series data for the period 1980-2014. The econometric techniques employed in testing the effects of the factors determining gross domestic savings were the cointegration test and the vector error correction models. This study utilized the following variables for data analysis: Dependency ratio, technological advancement, GDP growth, inflation, and interest rates. The study recommended an accelerated adoption of technology in the financial sector, promotion of economic growth and reduction of inflation.

DeFina, (1984) Studied the link between savings and interest rates with a focus the element of tax policy debate and found that tax policy does affect the rate of return but not to say that a reduction in the rate of return reduces savings, the reason for saving plays an important role as well. DeFina, (1984) concluded that both empirically and theoretically have not been able to prove the relationship between savings and interest rates and more needs to be done to clear and misconception and vagueness. As such policymakers should proceed with caution in the implementation of fiscal policy forms that might be costly to the economy. The study recommended that more studies need to be undertaken to fully comprehend the dynamics of fiscal policy reforms and their impact on savings.

Although the researcher did not find any empirical studies on Namibia that analysed the relationship between savings and interest rates as this study, there was one study by DeFina, (1984) done on savings and interest rates in the USA and found no direct relationship between interest rates and savings. Other related studies either looked at the determinants of savings; determinants of investment which included literature on interest rates. While some studies focused on different types of interest rates, only Shifotoka (2015) used the repo rate (bank rate). Shifotoka (2015) studied the Phillips curve in Namibia and found a Granger causality one-directional relationship between bank rate and inflation in Namibia.

According to empirical evidence, there is a negative relationship between investment and interest rates (lending and mortgage rates), but no relationship between savings and interest rate in Namibia (repo rate) has been reported empirically. However,

there should be a positive relationship between savings and interest rates according to the classical and neoclassical school of thought in existing literature, which means that higher interest rates provide an incentive to promote savings.

Ogbokor and Musilika (2014) as well as Eita (2013) used the neoclassical model ideology and found some applicability to the Namibian economy, although the study by Eita (2013) had mixed results. Some of the differences in findings are due to differences in methodologies and in variables used in related studies. None-the-less time series data variables in all the studies were tested for stationarity and co-integration as per the econometric requirement due to the nature of time series data. Due to the nature of the data, most of the studies employed the VECM because of the presence of cointegration between two or more variables.

# CHAPTER THREE: RESEARCH METHODS

## 3.1 Research design

The study used quantitative research methods for the purpose of analysing the short and long-run relationships between GDS and repo rate in Namibia. This was a desk research that utilized secondary time series data for the period 1980 to 2017.

## 3.2 Procedures

The data was collected from the IMF database, Namibia Statistics Agency and Bank of Namibia. The study used annual data for all the variables.

## 3.3 Data analysis

EViews 7.1 software was employed for the purpose of analysing the data. The data were tested for stationarity using the Unit root test while the Johansen cointegration test was used to test for cointegration among the variables. Cointegration is useful to determining the long run relationship between variables. The Granger causality test was then considered to test whether or not one variable is useful in forecasting another variable. From there on, the impulse response test was applied to trace the responses of the endogenous variables to one standard deviation shock of the system, which was then followed by the variance decomposition to test for potential outcomes of shocks in the model.

These tests were undertaken for the purpose of engendering confidence in the results as will now be explained in details. Stationarity testing is done to avoid the issue of spurious results and provides for long-run stability in the data. If a variable is non-

stationary, it can be differenced to make it stationary, when data is integrated of order "α", is denoted as I (α). When stationary at levels without being differenced then the data is integrated at level and as such I(0); if stationary after being differenced once, then the data is integrated of order 1, I(1) and if stationary after being differenced twice, then the data is integrated of order 2, I(2), (Shifotoka, 2015).

There are several testing methods for the presence of unit roots, most notably the Augmented Dickey-Fuller test (ADF) and the Philips and Perron test (PP) are the preferred approaches, (Shifotoka, 2015). The ADF tests a null hypothesis for the presence of unit roots, against an alternative hypothesis of no unit roots and is used preferably mainly because it allows for the presence of a non-zero mean and a constant deterministic drift and it takes into account serial correlation by the inclusion of lagged values of the differenced variable. The PP test suggests a non-parametric method of controlling for a higher order of autocorrelation in a series, (Sheefeni, 2017).

Once stationarity is confirmed, the data can be tested for cointegration, to determine the long run equilibrium of the data, (Gujarati, 2009), the equilibrium of the data is essential in determining whether there is any relationship between saving and interest rate. Cointegration is a property of a collection of time series variables and it states that if two or more variables do converge to some long-run equilibrium then they are said to be integrated and as such, they move together, (Sheefeni, 2017). According to Gujarati (2009), cointegration means that individually nonstationary variables can form a linear combination of two or more time series can be stationary.

There are several methods for determining the cointegration of variables: The Engle-Granger approach is most suitable for the univariate single equation and the Johansen cointegration approach, is applicable for the multivariate equation. Thus this study opted for the use of the Johansen cointegration test because it uses the Vector Autoregressive (VAR) which is a multivariate model. The Johansen cointegration test is used for models with more than one exogenous/independent variables. The Johansen test is preferred because it allows for more than one cointegrating relationship and that the sample size of the series is reasonably and sufficiently large (Gujarati, 2009).

The Johansen cointegration test has two components, namely the trace test and the maximum Eigenvalue test. The Trace test is a joint test that tests the null hypothesis which states that there are no cointegrating vectors ($H_0$; $r = 0$ or $H_0$; $r \leq 0$) present against the alternative hypothesis that there is cointegration ($H_1$; $r \geq 1$ or $H_1$; $r = 2$). Where $r$ = number of cointegrating vectors under the null. The Maximum Eigenvalue test conducts tests on each eigenvalue separately. It tests the null hypothesis that the number of cointegrating vectors is equal to $r$ ($H_0$; $r = 0$ or $H_0$; $r = 1$) against the alternative of $r$+1cointegrating vectors ($H_1$; $r = 1$ or $H_1$; $r = 2$). As such, this approach was chosen because most studies done on Namibia have used and is more reliable.

The Vector Auto-regression (VAR) approach is useful in studies of this nature. Variables that were included in the VAR model are: gross domestic savings, repo rate, and investment, with investment treated as a control variable. The adjustments to the VAR approach are made in order to suit the objectives of the study. When the series is not cointegrating, the unrestricted VAR is used to estimate the regression,

while the restriction is used for Vector Error Correction Model (VECM). The VAR is used for forecasting systems of interrelated time series and for analysing the dynamic impact of random disturbances on the system of variables.

In addition, the Granger causality test was applied to test the nature of causality between GDS and interest rates and also between saving, investment and interest rates in Namibia as used by Kalumbu and Nyambe (2014) and Ogbokor and Twedhi (2015). Determining the direction and level of causality between variables is essential for decision making. Policy makers need to be aware of the consequences of their policy directions. Given the dynamic systems of economies, one variable can have a simultaneous effect on a number of variables and in the same vein many variables can have simultaneous impact on a single variable. As such, it is important to know how the different variables interact and hence the importance of the continuous need for the study, (Shifotoka, 2015).

**Model specifications**

The generic multivariate vector autoregressive model is specified as follows:

$$\mathbf{Xt} = \mathbf{c} + \boldsymbol{A_1 X_{t-1}} + \boldsymbol{A_2 X_{t-2}} + \cdots + \boldsymbol{A_n X_{t-n}} + \boldsymbol{\varepsilon_t} \quad \ldots\ldots\ldots\ldots (1)$$

Where $X_t$ represents a column vector of the variables Gross Domestic Product (GDS), Investment, repo rate in the specified equation and $\varepsilon_t$ is the error term which caters for all other variables that could influence the output but were not included in the model, $A_1, A_2 \; and \; A_n$ are coefficients of the explanatory variables.

The VAR was chosen because according to (Kunst as cited by Shifotoka, 2015), it models every endogenous variable as a function of the lagged values of all the exogenous variables in the system and thus evades the need for structural modelling (Shifotoka, 2015). In addition the VAR is more flexible than univariate AR model, and is simple and easy in explaining, predicting and forecasting of economic variables any time as it also tests for weak exogenous variables parameter restrictions, (Al-Afeef & Al-Qudah, 2015).

### 3.4 Research Ethics

The researcher is cognizant of the confidentiality of certain data and shall take necessary precaution and abide with the ethical non-disclosure practice. The researcher is aware of the originality of other authors' work and was acknowledged correctly. The results of the study were reported correctly.

# CHAPTER FOUR: RESULTS AND ANALYSIS

## 4.1 Unit roots results

The Augmented Dickey-Fuller (ADF) unit root test and the Philip-Perron (PP) test were performed to ascertain for stationarity (absence of unit roots). The use of more than one test is to ensure the robustness of the results. In both tests, the data was tested at 1 percent, 5 percent, and 10 percent level of significance: The Null hypothesis states that there are unit roots (non-stationary) in the data, against the alternative hypothesis of no unit roots (stationary) in the data.

The rule of thumb for unit root test states that if the absolute value of t-statistics is greater than the absolute t-critical value, then the null hypothesis is rejected and it is concluded that there are no unit roots. If the null hypothesis is rejected, it implies that the data is stationary. If the absolute value of t-statistics is smaller than the absolute t-critical value, the null hypothesis is not rejected, and, there are unit roots in the data as such, the data is non-stationary.

If data is non-stationary, then they need to be differenced till they become stationary, if data is differenced then it means that data is integrated of order by the number of times the data is differenced. It is not recommended to use nonstationary data for analysis as that can lead to spurious results.

The results for the unit root test for gross domestic saving, investment, and repo rate have been presented the Table 4.1 below.

**Table 4.1: Unit roots test results for GDS 1**

| Variables | Model Specification | ADF levels | PP levels | ADF 1st difference | PP 1st difference | Order of Integration |
|---|---|---|---|---|---|---|
| GDS | Trend and intercept | -3.55 (-2.34) | -3.54** (-5.61) | -3.55** (-5.45) | -3.54** (-17.92) | I(1) |
| | P-value | 0.4043 | 0.0002 | 0.0005 | 0.0000 | |
| Repo rate | Trend and intercept | -3.54 (-3.29) | -3.54 (-3.29) | -3.54** (-7.97) | -3.54** (-11.44) | I(1) |
| | P-value | 0.084 | 0.084 | 0.0 | 0.0 | |
| Investment | Trend and intercept | -3.54** (-3.61) | -3.54 (-2.77) | -3.55** (-4.24) | -3.54** (-3.69) | I() |
| | P-value | 0.049 | 0.2181 | 0.0105 | 0.0360 | |

Source: Author's compilation and figures from EViews 7.1

Table 4.1 shows the results of the ADF and PP unit root tests for the GDS variable using trend and intercept for both tests. The results indicate that the GDS is non-stationary at levels for the 5 percent levels of significance. The null hypothesis for the existence of unit roots is not rejected, because the absolute value of the t-statistics (2.34) is smaller than the t-critical values of 3.55 at 5 percent. The p-value (0.4043) is greater than the 0.05 level of significance at 5 percent, therefore, the null hypothesis is not rejected and is thus concluded that the GDS is not stationary at levels.

However, after differencing once the stationarity changes and at first difference, the data for the GDS becomes stationary at 5 percent level of significance. At first difference, the absolute value of the t-statistics (5.450319) is greater than the absolute value of the t-critical value of 3.548490 at 5 percent (0.05). The p-value (0.0005) is smaller than the level of significance at 5 percent (0.05), thus the null hypothesis can be rejected at 5 percent level of significance. The PP test is also

[1] Note: ** denotes stationary at 5 % significance level

Numbers in parentheses are the test statistics

advocating for rejection of the null hypothesis at the first difference because, the absolute value of the t-statistics (17.92) is greater than the absolute t-critical value at the levels of significance of 5 percent (3.54) and with a p-value (0.0000) smaller than the 0.05 level of significance. Therefore, the null hypothesis is rejected (existence of unit roots) and as such the alternative hypotheses (no unit roots exist) are true and thus conclude that the GDS data is stationary at first difference.

Again, Table 4.1 shows the results for the ADF and PP unit roots test for the repo rate variable using trend and intercept for both tests. The results in the table 4.1 show that the repo rate is non-stationary at levels for the 5 percent levels of significance. The null hypothesis about the existence of unit roots is not rejected, because the absolute value of the t-statistics (3.29) is smaller than the t-critical values of (3.54) at 5 percent. The p-value (0. 0.0843) is greater than the level of significance at 5 percent (0.05), therefore, at 5 percent level of significance the null hypothesis is not rejected and is thus concluded that the repo is not stationary at levels.

However, after differencing once, the variable the repo rate becomes stationary at 5 percent level of significance. It also comes out that the absolute value of the t-statistics (7.97) is greater than the absolute value of t-critical value (3.54) at 5 percent (0.05). The p-value (0.000) is smaller than the 0.05 at 5 percent level of significance, thus meaning that the null hypothesis can be rejected at 5 percent level of significance. The PP test is also advocating for rejecting the null hypothesis at the first difference because the absolute value of the t-statistics (11.44) is greater than the absolute t-critical value at the levels of significance of 5 percent (3.54) and with a p-value (0.0000) is smaller than the 0.05 level of significance. Therefore, the null

hypothesis is rejected (existence of unit roots) and as such the alternative hypotheses (no unit roots exist) are true and thus conclude that the repo rate data is stationary at first difference.

The table 4.1 also shows the results for the ADF and PP unit roots test for the investment variable, the model tested used trend and intercept for both tests. The results in 4.1 above shows that investment is stationary in levels for 5 percent level of significance for the ADF test as the t-statistics (3.61) is greater than the critical value of (3.54). However, the PP test indicates non-stationarity at levels as the absolute value of the t-statistics (2.77) is smaller than the absolute value of the critical value of (3.54). For the ADF test the p-value (0.0429) is less than the level of significance at 5 percent (0.05) and, but for the PP test the p-value (0.2181) at 5 percent level of significance the null hypothesis is not rejected.

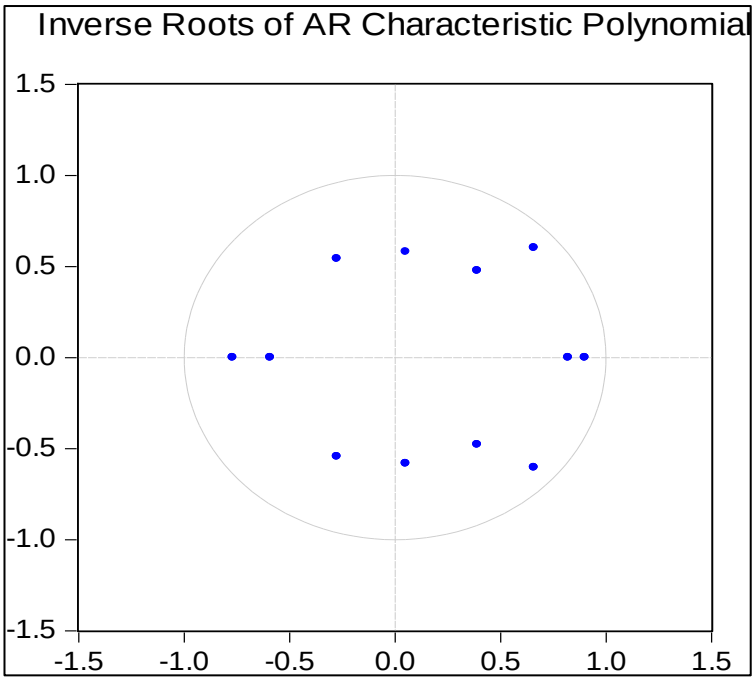
Thus, for the ADF, the null hypothesis is rejected, meaning the series is stationary at levels, however for the PP test the null hypothesis is not rejected, meaning that the series have unit roots. Given that the ADF test is considered more superior to the PP test, the results for the ADT test are chosen and as such conclude that the series is stationary at levels.

### 4.2 Stability test

The inverse roots of AR Characteristic Polynomial indicate the stability of the VAR. In this case, if all the roots lie within the circle then the VAR is considered to be stable. While if there are some roots that lie outside the circle then the VAR is

unstable. The results in the figure 4.1 below show that the VAR is stable because all the roots lie within the circle.

**Figure 4.1: Unit roots circle for Inverse roots of AR Characteristic Polynomial**




Source: Author's compilation and figures from EViews 7.1

### 4.3 Lag length selection criteria results

The optimal lag length is tested because it affects the VAR model as such; the lag length criteria test is used to ensure that the vector autoregression results are not spurious. The optimal lag length is chosen using a set of criteria in order to select the lag length chosen by the most criteria. The lag length criteria results are presented in the table 4.2.

**Table 4.2: Lag length selection criteria results**

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 0 | -316.9110 | NA | 29873.10 | 18.81829 | 18.95297 | 18.86422 |
| 1 | -268.8904 | 84.74220* | 3018.812* | 16.52297* | 17.06168* | 16.70668*[2] |
| 2 | -265.4983 | 5.387525 | 4260.407 | 16.85284 | 17.79559 | 17.17435 |
| 3 | -259.7051 | 8.178641 | 5332.338 | 17.04147 | 18.38826 | 17.50077 |
| 4 | -255.9363 | 4.655493 | 7772.313 | 17.34920 | 19.10002 | 17.94628 |

Source: Author's compilation and figures from EViews 7.1

In Table 4.2, the results of the lag length criteria test are presented. The lag length criteria test indicates that the optimal lag length is one, as chosen by the majority of the criteria. The optimal lag length of one was chosen by the *sequentially modified LR test statistic (each test at 5 percent level)* (LR); *Final prediction error* (FPE); *Akaike information criterion* (AIC)*; Schwarz information criterion* (SC)*; Hannan-Quinn information criterion* (HQ)

### 4.4 VAR Cointegration test

The Johansen Cointegration test works for series that are integrated of the same order and to determine the number of cointegration relations for forecasting and hypothesis testing. In this case, the Johansen cointegration test was used based on the trace and maximum eigenvalue in order to establish the order of cointegration of the variables. As a basis for rejecting or not rejecting the null hypothesis, the probability values (p-values) have to be compared to 5 percent (0.05) level of significance. Rule of thumb: the null hypothesis is rejected when the p-value is less than 0.05, and not rejected when the p-value is greater than 0.05.

[2] ** indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5 percent level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion*

**Table 4.3: Results for Johansen cointegration test (trace and maximum eigenvalue)**

| Trace Test | | | | | Maximum Eigenvalue Test | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Ho:** | Ha: | Trace Statistic | Critical value | P-value | Ho: | Ha: | Max-Eigen Statistic | Critical value | P-value |
| **r = 0** | r = 1 | 56.94 | 42.91 | 0.0012 | r = 0 | r = 1 | 29.89 | 25.82 | 0.0137 |
| **r = 1** | r = 2 | 27.05 | 25.87 | 0.0356 | r = 1 | r = 2 | 23.59 | 19.39 | 0.0115 |
| **r =2** | r =3 | 3.46 | 12.51 | 0.8177 | r =2 | r =3 | 3.46 | 12.52 | 0.8177 |

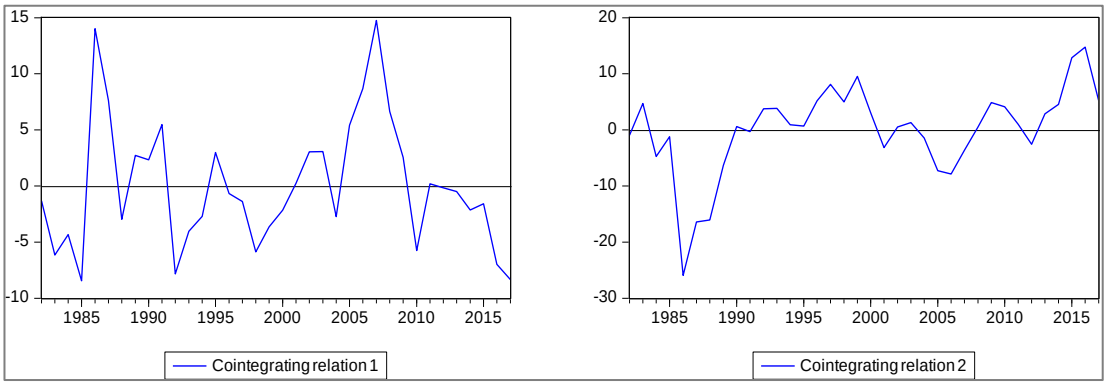
Source: Author's compilation and figures from EViews 7.1

The results in Table 4.3 indicate that at 5 percent (0.05) level of significance, the p-values of 0.0012 and 0.0356 are less than 5 percent (0.05), while the p-value of 0.8177 is greater than 5 percent (0.05). The null hypothesis for no cointegration for the two variables is rejected, while one null hypothesis is not rejected, concluding that there are two cointegrating equations. These two cointegrating equations indicate that there two linear combinations exist between the two variables whilst, investment is not cointegrated. This means that the variables gross domestic savings and repo rate are associated and as such move together in the long run.

The results for the maximum eigenvalue test indicate that at 5 percent (0.05) level of significance, the p-values of 0.0137 and 0.0115 are less than the 0.05 level of significance. As such the null hypothesis for no cointegration is rejected and at the level of significance there exist two cointegrating equations. The maximum Eigen value found two cointegrating equations.

Given that the results of the two tests (trace and maximum eigenvalue) advocate for the existence of two cointegrating equations, it can be concluded that there is a long run relationship between the two variables. The same relationship is graphically illustrated in (Figure 4.2) below. Given the existence of a long run relationship, the next step is to estimate the vector error correction model (VECM) in order to test the short-run relationship between the variables. The VECM allows for the estimation of the Granger causality test, the impulse response function and the variance decomposition tests.

**Figure 4.2: Cointegrating relations**




Source: Author's compilation and figures from EViews 7.1

## 4.5 VECM Estimates

The VECM is applied to a VAR model with variables that are cointegrated of the same order, which can be tested using either the Engle-Granger or the Johansen cointegration test. This study used the Johansen cointegration test and found two cointegrating equations, which means that the variables in the model are cointegrated and move together in the long run. When the coefficient is negative (-), then the coefficient is said to be statistically significant and causes a convergence towards the

long run equilibrium. When the coefficient is positive (+) that means that, the coefficient is statistically insignificant and there is a divergence from the long run equilibrium Given the long-run relationship, the study that needs to establish whether there is a short run relationship as well and as such run the VECM, which results are represented in table 4.4.

**Table 4.4: VECM Results**

| Vector Error Correction Estimates | | | |
|---|---|---|---|
| | | | |
| Error Correction: | D(GDS_GDS) | D(INV_INV) | D(REPO_RATE_REPO) |
| | | | |
| CointEq1 | -0.845178 | -0.001103 | 0.367307 |
| | (0.19981) | (0.16094) | (0.16266) |
| | [-4.22984] | [-0.00685] | [ 2.25808] |
| | | | |
| CointEq2 | -0.376783 | -0.137351 | -0.010391 |
| | (0.13612) | (0.10964) | (0.11081) |
| | [-2.76810] | [-1.25277] | [-0.09377] |
| | | | |
| D(GDS_GDS(-1)) | 0.102125 | 0.016008 | -0.215213 |
| | (0.13234) | (0.10659) | (0.10773) |
| | [ 0.77170] | [ 0.15018] | [-1.99766] |
| | | | |
| D(INV_INV(-1)) | 0.096889 | 0.363060 | -0.056206 |
| | (0.27396) | (0.22067) | (0.22302) |
| | [ 0.35366] | [ 1.64528] | [-0.25202] |
| | | | |
| D(REPO_RATE_REPO(-1)) | -0.019965 | 0.152412 | -0.300706 |
| | (0.21296) | (0.17154) | (0.17337) |
| | [-0.09375] | [ 0.88851] | [-1.73450] |
| | | | |
| C | -0.056932 | 0.018611 | -0.293532 |
| | (0.72535) | (0.58425) | (0.59049) |
| | [-0.07849] | [ 0.03185] | [-0.49710] |

*Source:* Author's compilation and figures from E-Views 7.1 () = standard error and []=t-statistics

With regards to the error correction term, the cointegrating equation1 indicates that the coefficients for GDS and Inv are statistically significant as they satisfy the condition: -1<CEq1<0. The 0.845 coefficient of d (GDS) means that the adjustment factor towards correcting for the disequilibrium is 84.50 percent in the next period, towards the long run equilibrium. When the coefficient is negative (-), it means that

there is a convergence to the long run and as such, there is a short run relationship if the adjustment factor is high.

The d (Inv) coefficient of 0.0011 means that the adjustment factor towards the correcting the disequilibrium is only 0.11 percent in the next period for the long run equilibrium. This means that the convergence takes longer because the adjustment factor is relatively low. The d (repo rate) coefficient of 0.367 is positive, this means that the condition (-1<CEq1<0) for statistical significance is not satisfied. However, this also means that the rate/speed of adjustment towards correcting the disequilibrium is 36.70 percent in the next period. The coefficient is positive (+) and that means that there is a divergence from the long run equilibrium.

Regarding the error correction term, the cointegrating equation 2 indicates that the coefficients for all the variables are statistically significant as they satisfy the condition: -1<CEq2<0. The 0.376 coefficient of d (GDS) means that the adjustment factor towards correcting for the disequilibrium is 37.60 percent in the next period, towards the long run equilibrium. When the coefficient is negative (-), it means that there is a convergence towards the long-run equilibrium and as such, there is a short run relationship because of the of adjustment factor which is high. The d (Inv) coefficient of 0.137 means that the adjustment factor towards the correcting the disequilibrium is only 13.70 percent in the next period for the long run equilibrium. This means that the convergence takes longer because the adjustment factor is relatively low. The d (repo rate) coefficient of 0.0103 is positive, this means that the condition (-1<CEq2<0) for statistical significance is not satisfied. However, this also means that the rate/speed of adjustment towards correcting the disequilibrium is 1

percent in the next period. The coefficient is positive (+) and that means that there is a divergence from the long run equilibrium.

Given that there are two co-integrating equations indicates that the data has long run relations and because their coefficients are statistically significant means the results indicate a convergence towards long-run equilibrium. This means that the error term corrects for the disequilibrium in the short run and causes a convergence towards the long run equilibrium.

### 4.6 Granger Causality

The Granger causality test was used to examine whether the lagged values of one variable Granger cause those of the other variables. Table 4.5 displays the results of the Granger Causality test. The probability values (p-values) are used as a criterion for accepting or rejecting the null hypothesis at 5 percent level of significance.

**Table 4.5: Granger Causality test results**

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| D(INV) does not Granger Cause D(GDS_GDS) | 35 | 2.41775 | 0.1063 |
| D(GDS) does not Granger Cause D(INV_INV) | | 1.53909 | 0.2310 |
| D(REPO_RATE) does not Granger Cause D(GDS) | 35 | 0.27476 | 0.7616 |
| D(GDS) does not Granger Cause D(REPO_RATE) | | 1.30347 | 0.2865 |
| D(REPO_RATE) does not Granger Cause D(INV) | 35 | 0.59077 | 0.5602 |
| D(INV) does not Granger Cause D(REPO_RATE) | | 0.86157 | 0.4327 |

Source: Author's compilation and figures from EViews 7.1

Case 1: The first null hypothesis states that investment does not Granger causes gross domestic savings, the probability value of 0.106 is greater than 0.05 level of significance, and such the null hypothesis is not rejected. The second null hypothesis state that gross domestic savings Granger causes investment, the probability value of 0.2310 is greater than 0.05 level of significance, meaning that the null hypothesis is not rejected. Therefore, both null hypotheses are not rejected and that investment does not Granger cause gross domestic savings and that gross domestic savings do not Granger cause investment. These imply that there is a non-directional relationship between gross domestic savings and investment.

Case 2: The first null hypothesis state that the repo rate does not Granger cause gross domestic savings. With this statement of proposition there is a probability value of 0.7616 and is greater than 0.05 level of significance. Therefore, the fact that the null hypothesis is not rejected, means that repo rate does should not be directly accounting for changes in gross domestic savings. The second null hypothesis states that gross domestic savings does not Granger cause repo rate, the results presents a probability value of 0.2865, which is greater than 0.05 level of significance informs that the null hypothesis does not have to be rejected. Since both null hypotheses are not rejected, means that there is a non-directional relationship between the repo rate and gross domestic savings.

Case 3: the first null hypothesis states that the repo rate does not Granger cause investment the probability value is 0.5602 and so is greater than the 0.05 level of significance. With this outcome, the null hypothesis is not rejected and as such the repo rate does not is not directly accounting for changes in investment. The second

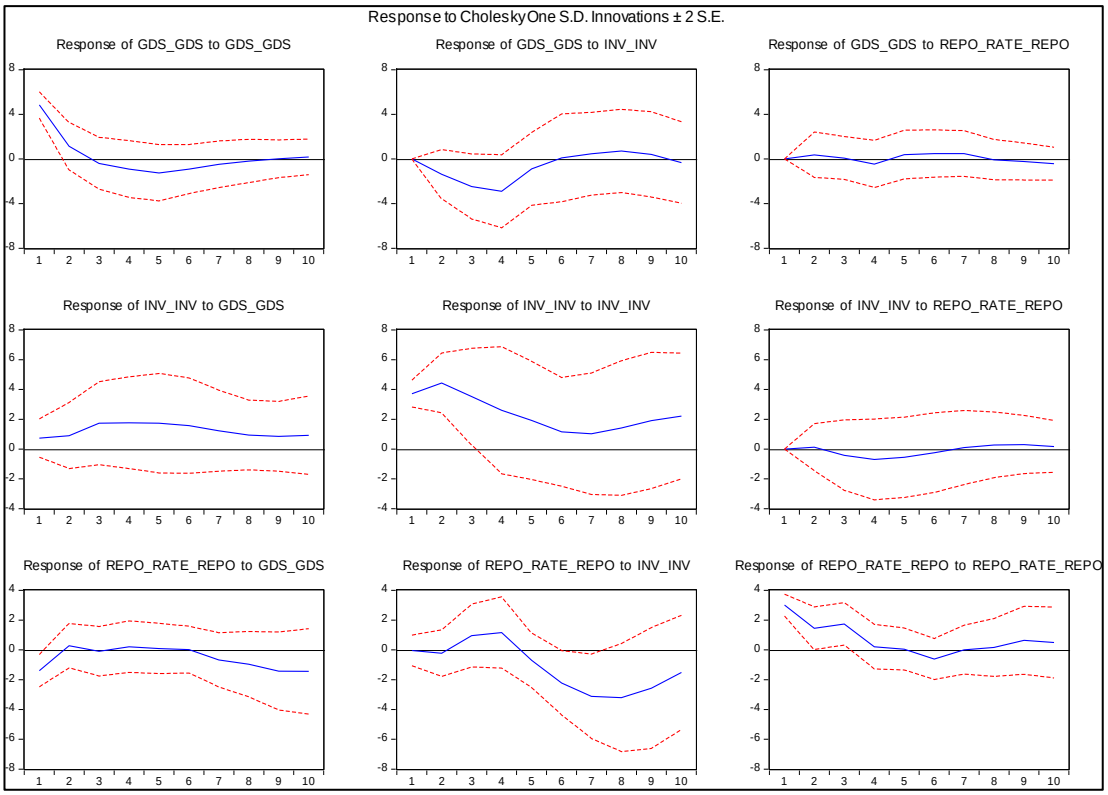
null hypothesis states that investment does not Granger cause repo rate. The results present a probability value of 0.4327, which is greater than the 0.05 level of significance. So, the null hypothesis is not rejected. Meaning that investment does not Granger cause the repo rate. Again, since both null hypotheses are not rejected it entails that there is a non-directional relationship between the repo rate and investment.

As stipulated in table 4.5, it can be concluded that there is no causality in the series at all levels of significance and that the lagged values of the variables cannot be used to explain the variation in the lagged values of the other variables. The evidence presented in Table 4.5 indicates that there is no causality between any of the variables in this study.

### 4.7 Impulse response

The impulse response function is used to trace out the response of the dependent variable in the VAR system to shocks in the error term through the tracing of a one-time shock to one of the innovations on current and future values of the variables in the system. The results of the impulse response function are presented in Figure 4.3.

**Figure 4.3: Results of impulse response function**



Source: Author's compilation and figures from EViews 7.1

Panel 1 indicates that an increase in GDS has an immediate effect on itself and is positively and statistically significant in the first two years. However, it becomes statistically insignificant and leads to a reduction in itself over a period of 5 years before the effects wear off and start to bottom out gradually such that by year 10, it becomes positive. The increase in GDS can stem from a number of factors (increase in income, shifting consumption patterns, etc.).

Panel 2, the response of GDS to an increase in investment is negative and statistically insignificant, in that an increase in investment causes a decline in the SD of GDS, and the bounds are below the baseline. An increase in investment causes a negative effect on GDS such that it remains below zero until year 6, after which it moves slightly above but remains low close to zero before going below zero again in year 10. Panel 3, the response to an increase in the repo rate is marginal and statistically

insignificant with GDS hovering around zero, mostly positive except years 4 and year 8 to 10.

Panel 4, the response of investment to changes of one S.D in GDS is positive, although positive the response is statistically insignificant to an increase in GDS has an increasing effect. The effect causing the biggest increase from year 2 through to year 8 and evening out thereafter and return to previous levels. The increase in GDS can emanate to several factors, including but not limited to increases in GDP, reduction in consumption, lifestyle preference changes, etc.

Panel 5, Investment has an initial positive response to increases in itself by increasing in the first year. Between the second and $7^{th}$ year, after the $8^{th}$ year, the response becomes positive and continues to increase. The increase in investment as a response to a one S.D increase in itself can be attributed to increases in foreign direct investment (FDI), increased government or private sector investment or increased financial market developments.

Panel 6, the response of investment to changes in repo rate is marginally negative, because the initial effect is negative. In the first year, there is no change as the repo rate increases, but from year 2 to year 5 the changes in repo rate causes a negative effect as investment declines as the repo rate increases. After year 8, the response becomes positive and hovers slightly above zero.

Panel 7, there is a fluctuation in the response of repo rate to one standard deviation (S.D) change in GDS is positive and statistically insignificant in the first year before hovering around zero from year 2 to year 6. Thereafter, the repo rate responds negatively to increases in one S.D of GDS by declining from year 7 onwards. The

fluctuation in the response does not conform to existing literature, which states that GDS has a positive correlation with interest rates.

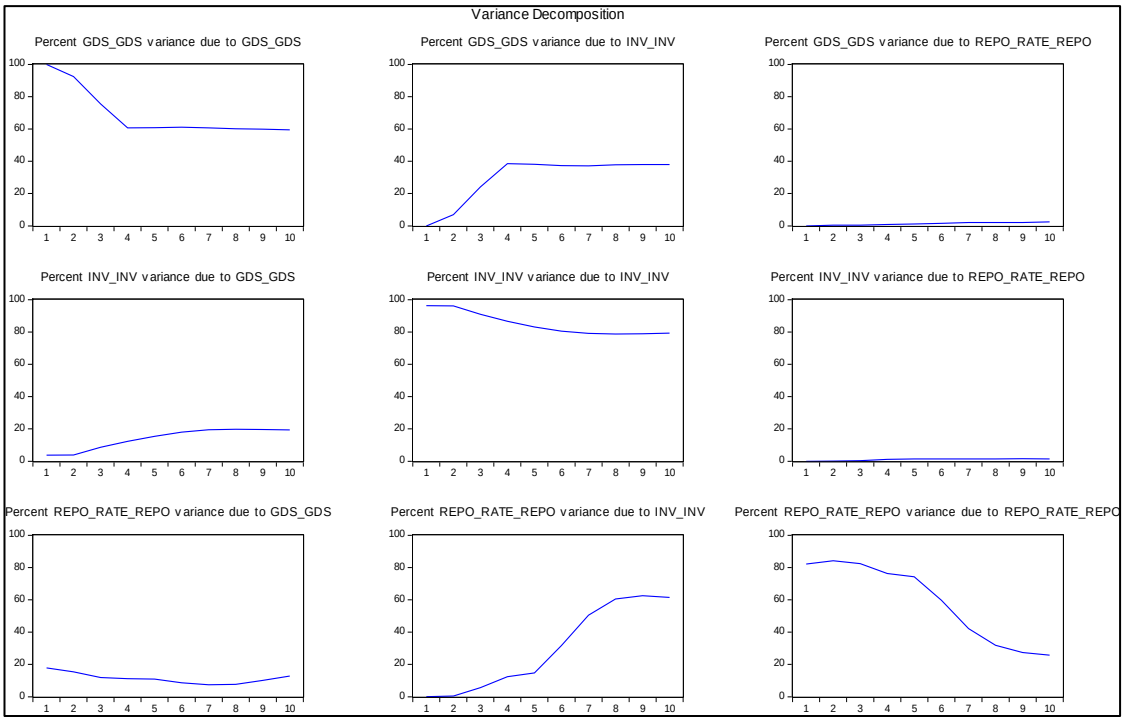
Panel 8, one S.D increase in investment has mixed effects on the repo rate and statistically insignificant, with the repo rate increases for the first year and then decline from year 2 to year 4. After year 4, it starts increasing for the rest of the period, including year 10.

Panel 9, the response of the repo rate to one S.D increase in the repo rate has a negative impact on itself in the initial stages of the period but it is statistically significant, before increasing steadily. The increase in the repo rate can be attributed to changes in the monetary policy stance by Bank of Namibia, sometimes in line with changes by South African Reserve Bank and other times due to domestic factors.

### 4.8 Variance Decomposition

The variance decomposition gives the proportions of the movement in the dependent variables that are due to their own shocks compared to shocks to the other variable. The variance decomposition determines how much of the s-step-ahead forecast error variance of a given variable is explained by innovations to each explanatory variable. This simply means that when a shock is applied to a variable, the shock not only affects that variable but it also affects all other variables in the system due to the dynamic structure of the VAR.

**Figure 4.4: results of the variance decomposition**




Source: Author's compilation and figures from EViews 7.1

The variance in GDS due to a shock applied to GDS is negative from year one through year 4; thereafter the variance stabilizes at around 60 percent through to year 10. It can be said that in the short run (1-4 years), the shock to GDS has a negative impact on the variance, but in the long run (8-10 years) the variance becomes constant. A shock applied to investment has an increasing effect on GDS in the short run, and over the long run, the impact becomes constant.

While a shock applied to the repo rate causes a marginal increase in GDS variance. The biggest impact of applied shock comes from that of GDS on itself; this is implied by the fact that the variance is hovering around 60 percent when the shock is applied to the variable itself. Thus variation in GDS is best explained by shocks applied to itself, then shocks to investment (40 percent) or the repo rate (5 percent).

The variation in investment due to a shock applied to GDS is positive albeit slightly slower in the short run and then increases at a constant rate in the long run. In the initial two years, the variation is marginal, from year 3 to year 7 the increase is accelerating before the increase becomes constant over the long run. The variation in investment caused by a shock to itself is initially constant in the first two years (short run) as it's stable, before declining marginally from 95 percent to around 80 percent in the long run.

In the long run, the impact is positive but at a slightly declining rate. The variations in investment due to shocks in the repo rate are minimal, hovering around zero. This means that a shock to the repo rate has a minimal effect on investment and as such shocks to the repo rate cannot explain variation in investment. Therefore, most variation in investment is strongly explained by shocks applied to investment itself, as opposed to shocks applied to GDS or the repo rate.

Although positive, the variation in repo rate caused by a shock to GDS is declining, hovering around 20 percent in the short run and 10 percent in the long run. The decline is rather smooth throughout till year 8, after which the variation starts increasing marginally. The variation in repo rate due to shocks applied to investment is positive and increasing throughout the whole period, in the short run, the variation is increasing slowly, after year 5 the increase accelerates significantly and continues on that increasing trajectory in the long run.

The variation in repo rate due to shocks applied to the repo rate is significantly negative with a slow decline in the short run and a sharper decline over the long run

before becoming constant. These imply that the repo rate best explains variations caused by shocks applied to itself according to figure 4.4. shocks applied to investment is positive and varies from below 20 percent in the short run and above 60 percent in the long run, while shocks applied to GDS causes a variation of around 20 percent in the short run and around 10 percent in the long run.

# CHAPTER FIVE CONCLUSIONS AND RECOMMENDATIONS

## 5.1 Conclusions

The main aim of the study was to investigate the relationship between GDS and the interest rate in Namibia. The first specific objective was to test for the short and long-run relationship between GDS and the interest rate and the second specific objective of the study was to test for causality between GDS and the interest rate. The study used GDS as a proxy for savings and the repo rate at a macro level as a proxy for interest rates as it forms the basis of all interest rates in the country, to evaluate how the economy can promote and advocate for savings. The study reviewed existing empirical and theoretical literature on savings, interest rates, and related subject matter. This was followed by the methodology section, which observed the different types of econometric techniques that are used in data analysis. The section of the results and discussion followed.

The study analysed time series data for GDS, repo rate and investment data for the period 1980 – 2017, and the VECM model was used to estimate the data. Firstly, the data was found to be non-stationary at levels but became stationary only at first difference when tested for stationarity using the ADF and PP unit roots test and the data. The cointegration test revealed two cointegrating equations which imply that two of the variables are cointegrated and move together in the long run. Given the presence of cointegration, the VECM was used because it allows for the deviation from long-run equilibrium to be corrected gradually through a series of partial short-run adjustments. The VECM was estimated to investigate the short run properties

between the variables. The estimation also allows for the testing of Granger causality, impulse response functions, and variance decomposition testing.

The Granger causality test revealed that there is non-directional interaction between the variables, which means that there is no causality between GDS and the repo rate. It also implies that GDS does not Granger cause the repo rate and that the repo rate does not Granger cause GDS, however, this does not conform to existing literature which was applied by the Bank of Namibia in 2014 when the repo rate was increased to curb consumption to reduce the high import bill and subsequently promote savings, (Bank of Namibia, 2014). The no causality finding between GDS and investment contradicts the findings by Eita (2013).

The impulse response function results indicate that, GDS response fluctuates about zero, albeit marginally positive, to one standard deviation to the repo rate, this means that when the repo rate in Namibia increases, the effect on GDS is marginally positive and might not have the desired effect. The result of minimal immediate impact is in line with finding by Ogbokor and Musilika (2014). However, this does not conform to the classical theory on savings and the assumptions made by the Central Bank in Namibia in 2014 when it increased the repo rate in order to reduce the import bill and hence promote savings and discourage credit-based consumption. The difference between the findings and the literature could be due to the currency peg arrangement because the Namibian monetary authority have to be aligned with the monetary decision by the South African Reserve Bank.

There is no directional response by investment to a one standard deviation increase in the repo rate. Such entails that an increase in the repo rate causes a fluctuation in investment with no clear impact. This is rather contradictory to existing theoretical assumptions on interest rates and investment and thus implies that increasing the repo rate to affect investment will not yield the desired impact. Although the repo rate is the basis for all interest rates in the Namibian economy, it seems that at a macro level, the interaction of the variables is slightly different.

One standard deviation in GDS has a positive impact on investment, as such an increase in GDS leads to an increase in investment in the short run however, and the effect wears off in the long run. This means that GDS can be boosted and used to enhance investment from local resources, GDS can be boosted in the form of saving promoting policy incentives and thus reduce dependency on foreign direct investment (FDI) and debt. The results are in concurrent findings from the studies by Eita (2013), Nghifenwa (2009) and Ogbokor and Musilika (2014).

The Johansen cointegration test and VECM results indicate the existence of a short and long-run relationship between savings (GDS was used as a proxy) and the interest rates (repo rate) in Namibia as the study found two cointegrating relations for both repo rate and GDS. The findings on the short and long run relationship are in line with existing literature the classical and neoclassical school of thought, Eita (2013) and Ogbokor and Musilika (2014).

The study, however, did not find any Granger causality between savings and repo rate and these findings are contrary to expectations of the study, as well as the

finding from existing literature: the classical and neoclassical school of thought, Eita (2013) and Ogbokor and Musilika (2014). The deviation in the findings to existing literature could be attributable to the high capital mobility as found in, (Uanguta, et al., 2004), as well as the currency peg arrangement.

### 5.2 Policy recommendations

Given that the study found a short and long run relationship between repo rate and GDS but, not the causality between GDS and repo rate, the impact of the repo rate on GDS is expected to be marginally positive. It means that caution should be exercised when the monetary authority indents to change the repo rate in an effort to cause a shift in GDS. The repo rate can be used to cause a change in GDS but because the impact is minimal, it is recommended that the Namibian monetary authority can implement the monetary policy (repo rate) concurrently with changes in other savings shifting variables and policies.

Variables such as income, inflation, and population growth rate as concluded by Ogbokor and Musilika (2014) are better at causing an immediate impact on GDS as opposed to the repo rate. As such, the adjustment of the repo rate (monetary policy), as a remedial tool for a declining GDS should be accompanied by other savings promoting policies and incentives. As proven by Shifotoka (2015), the inverse relationship between inflation and savings can be used to promote savings by implementing inflation reducing policies, which include but is not limited to the reduction of interest rates via the reduction in the repo rate.

Due to the possible effect of being part of the CMA, one of the opportunity cost is the high capital mobility and therefore, the Namibian authority should re-evaluate the cost benefit analysis of remaining part of the CMA. The study found a positive short run relationship between GDS and investment, but high capital mobility reduces available savings from being used as investable funds in the economy. This creates a financial gap and hence increases over-reliance on FDI and debt.

The negative consequence of FDI is the repatriation of profits and as such a low multiplier effect in the domestic economy. It is, thus, important for the Namibian authorities to create a domestic investor friendly environment by implementing incentives that would increase domestic investor yields and reduce the high capital mobility, accelerate the deepening of the financial sector instruments for investment to increase yields.

As Namibia is a developing economy and has a dire need for developmental finance to promote the developmental agenda of the nation, future researchers should focus on finding other savings promoting incentives and policies which will reduce over-reliance on FDI and debt.

**REFERENCES**

Al-Afeef, M. A. & Al-Qudah, A. A.,(2015). The Causal Relationship between Savings and Investment in Jordan. *Journal of Economics and Sustainable Development*, 6(10), 229-238.

Alimi, S. R., (2013). Keynes' Absolute Income Hypothesis. *Munich Personal RePEc Archive* [online]available from https://mpra.ub.uni-muenchen.de/id/eprint/49310 [accessed on 09th September 2018]

Arok, A. B., (2014). *Determinants of gross domestic savings in Kenya.*MA Thesis: University of Nairobi. Nairobi, viewed 26 September 2018 <http://erepository.uonbi.ac.ke/bitstream/handle/11295/95128/MONICAH%20KIVINDUX50689052015.pdf

Bank of Namibia, (2014). Bank of Namibia *2014 Annual Report,* Windhoek: Bank of Namibia.

Bank of Namibia, (2016). Bank of Namibia 2016 *Annual Report,* Windhoek: Bank of Namibia.

DeFina, R. H., (1984). *The link between Saving and Interest Rates: A Key Element in the Tax Policy Debate.* Philadelphia: Federal Reserve Bank of Philadelphia .

Duesenberry, (1949). *Income, Saving and the Theory of Consumer Behaviour.* Cambridge: Harvard University Press.[online] available from: https://www.persee.fr/doc/reco_0035-2764_1953_num_4_5_407004_t1_0777_0000_001[Accessed 25 August 2018].

Fisher I. (1930). Econlib, (2017). *Econlib.*Theory of Interest [Online] Available at: http://www.econlib.org/library/Enc/bios/Fisher.html [Accessed 30 August 2018].

Eita, J. H.,( 2013). Determinants of Investment in Namibia. *Corporate Ownership & Control,* 10(4), 21-30.

Friedman, M., (1957). *A Theory of the consumption function.* s.l.[online]:Princeton University Press. Available from: http://www.nber.org/books/frie57-1.[accessed 12 December 2017].

Friedman, M., (1987). Quantity theory of money. *A Dictionary of Economics,* Volume 4,15-19.

Gujarati, D., (2009). *Basic econometrics.* [Online].Available at: http//booksee.org [Accessed 13 May 2017].

Hutt, W., (1975). *A Rehabilitation of Say's Law.* Athens: Ohio, University Press.

Jagadeeshy, D., (2015). The impact of savings in economic growth; An Empirical study based on Botswana. *International Journal of Research in Business studies and management,* September, 2(9), 10-21.

Kalumbu, S. A. & Nyambe, J. M., (2015). Is There A Casual Relationship Between Lending Interest rate and credit availability to Households in Namibia. *British Journal of Economics management and trade.[online]* 7(4), 288-295.available from: DOI: 10.9734/BJEMT/2015/13982 [Accessed 03 January 2018].

Keynes, J. M., (1946). *The General Theory of Employment, Interest, and Money.* Palgrave: Macmillan.

Modigliani, F., (2005). *The Collected Papers of Franco Modigliani.* 6th ed. London: The MIT Press.

Namibia Statistics Agency, (2017). *National Housing Income and Expenditure Survey 2015/16,* Windhoek: Namibia Statistics Agency.

Namibia Statistics Agency, (2018). *Preliminary National Accounts 2017,* Windhoek: Namibia Statistics Agency.

Nangula, P.,(2014). *Lecture Notes: Consumption and Investment Unit 3.* PowerPoint slides. Windhoek: University of Science and Technology. Viewed 12 January 2018

Nghifenwa, F. N., (2009). '*Factors influencing Investment: A case study of the Namibian Economy'.* (unpublished masters thesis: University of Namibia.

Windhoek).available from: http://repository.unam.na/handle/11070/98/recent-submissions?offset=30.[accessed 12 January 2018].

Ogbokor, C. & Musilika, O., (2014). Investigating the relationship between aggregate savings and investment in Namibia: A causality analysis. *Research Journal of Finance and Accounting,* 5(6), 82-89.available from: https://iiste.org/Journals/index.php/RJFA/article/viewFile/11914/12267[accessed 15 January 2018].

Ogbokor, C. & Kwedhi, N. T., (2014). A study of the determinants of mortgage interest rates in Namibia. *International Journal of Economics, commerce, and management,* 2(7), 1-13. Available from: *http://ijecm.co.uk/* ISSN 2348 0386. [Accessed on 5 March 2018].

Ogbokor, C. & Samahiya, O. M., (2014). A Time series analysis of the determinants of Savings in Namibia. *Journal of Economics and Sustainable Development,* V(8), 52-64. Available from: www.iiste.org/ ISSN 2222-2855. [Accessed on 5 March 2018].

Samahiya, M. & Kaakunga, E., (2014). Determinants of Commercial Banks' Interest Rate Spread in Namibia: *Botswana Journal of Economics, 1-10.*

Schenk, R., 2013. *Cyber Economics.* [Online]
Available at: http://ingrimayne.com/econ/FiscalDead/LifeCycle.html
[Accessed 20 November 2018].

Sheefeni, P., (2017). *Lecture notes: Times Series Analysis, distributed in Advanced Econometrics.* The University of Namibia. Windhoek.

Shifotoka, H., 2015. *Investigating the relationship between the bank rate, unemployment, and inflation: the Phillips curve in Namibia.* (unpublished Masters Thesis: University of Namibia. Windhoek) [Online]. [Accessed on 23 August 2018 ].

The Banking Association South Africa, 2018. *The Banking Association of South Africa.* [Online]
Available at: www.banking.org.za/consumer-information-conventional-banking
[Accessed 08 August 2018].

Uanguta, E., Haihambo, E., Kadhikwa, G. & Chimana, S., (2004). The Structure and Nature of Savings in Namibia. *BoN Occasional Paper,* 8(4). Available from: ISBN: 99916-61-16-6/http://www.bon.com.na. [Accessed on 23 August 2018].

Wang *J., Masha I., Shirono, K., and Harris, L.* (2007). The Common Monetary Area in Southern Africa: Shocks, Adjustment, and Policy Challenges. [Online] IMF Working Paper, WP/07/158. Available from:www.imf.org/E42, F33, F36. [Accessed on 10 October 2018].

Welsh, C. E., 2010. *Monetary Theory and Policy.* 3rd ed. s.l.: Massachusetts Institute of Technology. Massachusetts.

Zamuee, M. F., 2015. The efficiency of Pension Funds in Namibia. *American Journal of Marketing Research,* 1(3), 106-112.

**Annexure A**

Data table

| Year | GDS | Inv | Repo rate |
|---|---|---|---|
| **1980** | 28.6 | 19.5 | 5.94 |
| **1981** | 5.1 | 17.5 | 10.76 |
| **1982** | 2.6 | 14.5 | 16.53 |
| **1983** | 4.2 | 11.2 | 12.42 |
| **1984** | 0.9 | 9.6 | 15.82 |
| **1985** | 10.0 | 9.7 | -0.69 |
| **1986** | 8.6 | 8.6 | 6.38 |
| **1987** | -0.6 | 8.7 | 6.55 |
| **1988** | 4.3 | 9.7 | 12.35 |
| **1989** | 4.5 | 10.5 | 16.49 |
| **1990** | 17.7 | 12.4 | 14.59 |
| **1991** | 13.4 | 8.9 | 19.7 |
| **1992** | 19.7 | 11.5 | 17.9 |
| **1993** | 18.4 | 12.4 | 15.4 |
| **1994** | 19.1 | 13.0 | 14.8 |
| **1995** | 19.8 | 14.4 | 16.9 |
| **1996** | 15.8 | 16.4 | 17.5 |
| **1997** | 14.0 | 13.6 | 17.3 |
| **1998** | 13.8 | 16.4 | 18.5 |
| **1999** | 14.8 | 16.5 | 14.1 |
| **2000** | 13.9 | 14.5 | 11.3 |
| **2001** | 8.7 | 19.4 | 10.5 |
| **2002** | 14.4 | 18.4 | 11.7 |
| **2003** | 12.1 | 16.8 | 10.9 |
| **2004** | 19.6 | 15.9 | 7.6 |
| **2005** | 22.3 | 16.0 | 7.1 |
| **2006** | 20.7 | 19.4 | 7.7 |
| **2007** | 19.0 | 20.7 | 9.6 |
| **2008** | 11.6 | 23.8 | 10.5 |
| **2009** | 2.2 | 27.1 | 7.7 |
| **2010** | 11.2 | 25.3 | 6.9 |
| **2011** | 8.6 | 23.0 | 6.0 |
| **2012** | 6.2 | 28.7 | 5.8 |
| **2013** | 3.9 | 30.9 | 5.5 |
| **2014** | 4.0 | 38.8 | 5.8 |
| **2015** | -2.0 | 39.8 | 6.4 |
| **2016** | -6.6 | 29.4 | 6.9 |
| **2017** | -4.0 | 21.4 | 6.9 |