The relationship between saving mobilisation, investment and economic growth in Namibia

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Declaration

I, **Elise Ndapewoshali Hishongwa**, declare that the entire body of work contained in this research assignment is my own, original work; that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

E.N. Hishongwa   31 October 2015

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Abstract

The study sought to analyse the dynamic relationship between domestic savings, investment and economic growth in Namibia, and ascertain the direction of causality between domestic savings, investment and economic growth, using the vector auto-regression methodology. This method relies on the use of impulse response functions and forecast error variance decompositions. The major findings of the study are outlined below.

First, the study shows that shocks to savings affect savings, investment and economic growth positively and significantly. In addition, shocks to investment significantly affect investment and savings in the short run, but they are insignificant in explaining economic growth. Further, shocks to economic growth significantly influence savings, investment and economic growth. Second, the variance decomposition results show that the variation in savings is largely explained by shocks to savings, investment and economic growth, in that respective order of size. Furthermore, the variation in investment is explained significantly by shocks to all three the variables although it can be noted that savings and economic growth are more important in explaining investment in the long run than investment. The study also established that variations in economic growth are not explained by investment shocks in both the short and long runs. In brief, savings shocks are more important in explaining variations in economic growth than economic growth in the long run.

Key words: Granger Causality, savings, investment, economic growth, stationarity, impulse response functions, variance decomposition

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List of acronyms and abbreviations

ADF	Augmented Dickey Fuller Test
AIC	Akaike Information Criterion
AIDS	Acquired Immunodeficiency Syndrome
AR	Autoregressive
ARDL	Autoregressive Distributed Lag
BoN	Bank of Namibia
CI	Cointegration
ECM	Error Correction and Model
FEVD	Forecast Error Variance Decomposition
GDP	Gross Domestic Product
GDP	Real Gross Domestic Product
GFCF	Investment or Gross Fixed Capital Formation
HIV	Human Immunodeficiency Virus
HQ	Hannan-Quinn Information Criterion
IMF	International Monetary Fund
LDCs	Least Developed Countries
LNGDP	Logarithm of Real GDP
LNGFCF	Logarithm of Investment
LNSAV	Logarithm of Savings
LR	Likelihood Ratio
M2	Broad Money
MTEF	Medium Term Expenditure Framework
NAMFISA	Namibia Financial Institutions Supervisory Authority
NDP4	National Development Plan Four
NPC	National Planning Commission
NSA	National Statistic Agency
NSX	Namibian Stock Exchange

OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PP	Phillips-Perron
SAV	Savings
SEMs	Simultaneous Equation Models
SIC	Schwarz Information Criterion
SSA	Sub-Saharan Africa
SVAR	Structural Vector Autoregression
TIPEEG	Targeted Intervention Programme for Employment and Economic Growth
USD	United States Dollar
VAR	Vector Autoregressive (VAR)
WB	World Bank
ZAR	South African Rand

CHAPTER 1
INTRODUCTION AND BACKGROUND TO THE STUDY

1.1. INTRODUCTION

Research has shown that aggregate saving in an economy is a prerequisite for raising investment funds, which in turn leads to economic growth. Saving, defined as the fraction of disposable income that is set aside for future consumption, constitutes an essential tool for economic growth and development (Temidayo & Taiwo, 2011). It aids capital formation by raising the stock of capital and its effect promotes higher incomes in the economy. Investment contributes to growth in aggregate wealth. Nevertheless, investment cannot increase without increasing the amount of savings. Thus, savings perform a major role in providing the national capacity for investment and production, which will affect the potential of economic growth. A serious constraint to sustainable economic growth can be caused by a low saving rate. Thus, real development or growth of a country requires investment, which is a function of savings.

This is the fundamental argument of the financial liberalisation hypothesis of McKinnon and Shaw (1973). McKinnon and Shaw (1973) argued that the slow growth rate experienced by many developing and African countries in the 1970s is because of financial repression, that is, government intervention in the smooth functioning of the financial markets through such things as directed credit schemes, interest rate ceilings, exchange rate controls and government ownership of banks. Consequently, they recommend that for developing and African countries to catch up with the growth rate of advanced economies, the domestic financial markets should be liberalised. McKinnon and Shaw (1973) explained that in order to reach higher savings and therefore investment rates, the government should eradicate interest rate ceilings and allow real interest rates to be determined by the forces of demand and supply in the market. They argued that an increase in savings rate would promote investments and finally lead to economic growth as well as lower inflation.

Namibia, just like any other Sub Saharan African country (SSA), equally had repressive financial policies in place during the 1970s when it was under South African colonial rule. This relationship meant that any policy that was implemented in South Africa was also applicable in Namibia. Some of the policies implemented included: financial liberalisation, which was initiated after the De Kock Commission Report (De Kock, 1978, 1985), interest rates and credit controls, which were eradicated in 1980, and credit ceilings, which were in use during the period 1967 to the 1970s (Odhiambo, 2011). All these fall under the structural adjustment programmes coordinated by the IMF aimed to re-orientate the economies and the financial sectors of developing and African countries to enable the financial sector to perform its intermediation role (Imam & Malik, 2007).

Since Namibia was under the authority of South Africa, the financial reforms implemented by South Africa during the structural adjustment phase were also instituted in Namibia. Hence, after independence from South Africa in the 1990s, the financial sector of Namibia mirrored the financial sector of South Africa. For example, the majority of the banks that operated in Namibia were South African owned and this has not changed to date. Moreover, Namibia inherited a dual economy at independence with great challenges such as high unemployment, high poverty levels, especially among the black people, low economic growth, unequal distribution of wealth and income as well as low domestic savings (National Planning Commission, 2012).

In terms of domestic savings, Namibia, like many other Sub Saharan African (SSA) countries, lags behind in terms of domestic savings (World Bank, 2014). According to the World Bank (2014), Namibia is classified as an upper middle-income country with Gross Domestic Product (GDP) per capita of about USD 6745. The country receives less official assistance on average because of this classification. This reduction in official development assistance means that for Namibia, high domestic savings are a critical factor to fund investment projects and overcome the challenges of declining external funding.

1.2.   PROBLEM STATEMENT

Domestic mobilisation savings play an important role as a cheaper source to finance investment in microenterprises in urban and rural areas, as external finance is expensive and may be subject to exchange rate risk. Thus, increased domestic mobilisation is likely to have a multiplier effect on the economy. By mobilising more deposits for investment from the public, the domestic financial sector as well as increased outreach develops in the process. The deposits base of the financial sector becomes more diversified as various types of savers are brought into the formal sector and this increases the resources available to finance investment by banks. This low domestic saving mobilisation poses a serious challenge for sustainable development, given the decline in official development assistance received by the country following its classification as a middle-income country (World Bank, 2014).

On the empirical front, studies on domestic saving mobilisation for investment and the effect for economic growth have attracted some research attention. These studies highlight that savings have a positive impact on investment and economic growth in both the short and long term. Furthermore, other studies examined the relationship between financial liberalisation savings and investment as well as the determinants of savings. The overall results suggest that high levels of saving significantly influence the level of investment, which in turn promotes economic growth (Shiimi & Kadhikwa, 1999; Odhiambo, 2011; Odhiambo & Owusu, 2012).

However, this relationship has not received enough research attention in Namibia. Studies that have attempted to examine this relationship in Namibia include Ogbokor and Samhiya (2014) and Shimi and Kadhikwa (1999), who focused on the determinants of saving and investment behaviour. The study by Ogbokor and Samahiya (2014) used Ordinary Least Squares (OLS) and the one by Shimi and Kadhikwa (1999) employed the cointegration and error correction and modelling (ECM) techniques to investigate the determinants of savings and investment.

Finally, Kandenge (2004) examined the effect of public and private investment and economic growth in Namibia for the period 1970 to 2005. This study employed the endogenous growth model and the cointegration and error correction modelling techniques and found out that factors such as exports and imports, economic freedom, labour and human capital development have an impact on economic growth apart from public and private investment.

Thus, the above empirical review from Namibia suggests that the relationship has not been well exploited; as such, our knowledge of the relationship between domestic saving mobilisation for investment and hence growth in Namibia is limited. This study attempted to fill this gap by examining the effect of domestic saving mobilisation for investment and hence growth in Namibia, using the Johansen cointegration technique with annual data from 1990 to 2013. The findings from this study provide more insights on the important role of domestic savings, which will stimulate policy debate on the formulation of policies that will encourage domestic deposit mobilisation. The study is significant in that it provides information about the direction of causality between savings, investment and economic growth. The information helps determine whether the way these three variables relate in Namibia is in line with what theory says or not; hence the information is very important as far as policies on savings and investment are concerned. If the policy makers are armed with the right information about the way these variables relate statistically, they are able to make the correct policy decisions that benefit the economy.

1.3. RESEARCH OBJECTIVES

The main objective of the research was to examine the interaction between domestic saving mobilisation, investment, and economic growth. The specific objectives used by the current study were to:

- Analyse the dynamic relationship between domestic savings, investment and economic growth in Namibia;

- Ascertain the causality between domestic savings, investment and economic growth, using impulse response functions and variance decomposition techniques; and

- Offer policy recommendations to the policy makers based on the results obtained.

1.4. RESEARCH QUESTIONS

The following are the research questions that were employed in the current study:

- What is the relationship between savings mobilisation and investment?
- What is the relationship between savings mobilisation and economic growth?
- What is the relationship between investment and economic growth?
- What is the direction of causality between domestic saving, investment and economic growth?

1.5. METHODOLOGY

The study sourced secondary data from the WB World Development Indicators, the Bank of Namibia (BoN), and the National Statistic Agency (NSA), for the period 1990 to 2013. Annual data for domestic saving, gross fixed capital formation (investment) and gross domestic product growth rate was collected from these sources. The study used the Johansen cointegration methodology to estimate and analyse the data for the three variables of interest in this study. This methodology gave the impulse response functions and the variance decomposition functions, which were used to explain how these three variables are related.

1.6. SIGNIFICANCE OF THE STUDY

The study contributes to the literature on the relationship between domestic saving mobilisation, investment and growth in Namibia, which is apparently limited in Namibia. It provides information that will be useful for policymakers to understand the effect of saving on economic growth, which in turn would definitely enhance the policy making process in Namibia. It enriches our understanding of the connexion between savings, investment and growth. It will give policymakers parameters to work with in the formulation of financial policies, especially on credit allocation to borrowers; and this is expected to have a second-round effect on economic growth.

1.7. SCOPE OF THE STUDY

This study examined the relationship between savings, investment and economic growth in Namibia using annual data from 1990 to 2013. The study employed the following variables: savings mobilisation, investment, and economic growth. The study was limited to the Namibian economy to see whether these variables meaningfully influence one another.

1.8. CHAPTER OUTLINE

This research report consists of six chapters: Chapter 1 covers the introduction, problem statement, the objectives and research questions of the research as well as the significance of the study. Chapter 2 provides the background and an economic overview of Namibia. Chapter 3

highlights the literature review that comprises a theoretical framework and an empirical literature review. Chapter 4 explains the research methodology used in the study. Chapter 5 presents and interprets the results of the study, while Chapter 6 discusses the conclusion and recommendations from the study.

CHAPTER 2

BACKGROUND AND OVERVIEW OF THE NAMIBIAN ECONOMY

2.1. INTRODUCTION

This chapter focuses on a brief overview of the Namibian economy and attempts to analyse the trends of the variables of interest in Namibia. A descriptive analysis of the relationship between savings, investment and economic growth will be done. The aim is to lay the groundwork and set the *a priori* expectation of the empirical analysis in chapter 4. The rest of the chapter is presented as follows: section 2.2 discusses the Namibian financial system and section 2.3 briefly reviews the monetary policy. Section 2.4 presents a descriptive analysis of the variables used in the empirical analysis. Finally, section 2.5 presents the conclusion.

2.2. NAMIBIA FINANCIAL SYSTEM

The financial system of Namibia consists of financial markets, semi-formal and informal financial sectors. The formal financial sector can further be divided into banks, stock markets and non-bank financial sectors such as pension funds, mortgages and insurance companies. The banks are the major players when it comes to saving mobilisation. They accept deposits from households and firms and grant short and long-term loans. Secondly, the semi-formal sector is made up of microfinance institutions that can further be divided into different types, namely microfinance banks that mobilise deposits from the community and grant small loans for individuals to smooth consumption and business loans for SMMEs firms such as the SME Bank; FNB Consumer Loans; and the Development Bank of Namibia. The final type of finance sector in Namibia is the informal sector made up of moneylenders and pawnbrokers.

According to the Bank of Namibia (2014), the central bank has the objective to promote and maintain a sound monetary policy and financial system stability in Namibia, and to sustain liquidity, solvency and effective functioning of the system. Regardless of the objective of the Bank of Namibia to promote and maintain a sound financial system, the financial institutions are regulated and supervised by the Namibian Financial Institutions Supervisory Authority (NAMFISA). The mandate of NAMFISA with regard to financial stability includes supervision of the business of financial institutions and financial services and providing advice to the Minister of Finance on matters related to financial institutions and services. The stability of the financial system is critical, as the system provides important services to households, corporates, and the real economy.

The Namibian financial institutions are dominated by commercial banks (which accept deposits and make loans directly to borrowers), commercial bank assets (accounting for 38 per cent of the market), and non-bank financial intermediaries, which lend via the purchase of securities and make

up the remainder. The latter category includes insurance companies, pension funds, and investment trusts, which purchase securities, thus providing capital indirectly rather than making loans. Financial institutions hold the potential to contribute extensively to development and economic stability in Namibia, both through providing an enabling environment for business and contributing directly to the development of the real sector through project financing, which in turn affects the overall economy. Figure 2.1 presents percentages of total assets within the financial system.
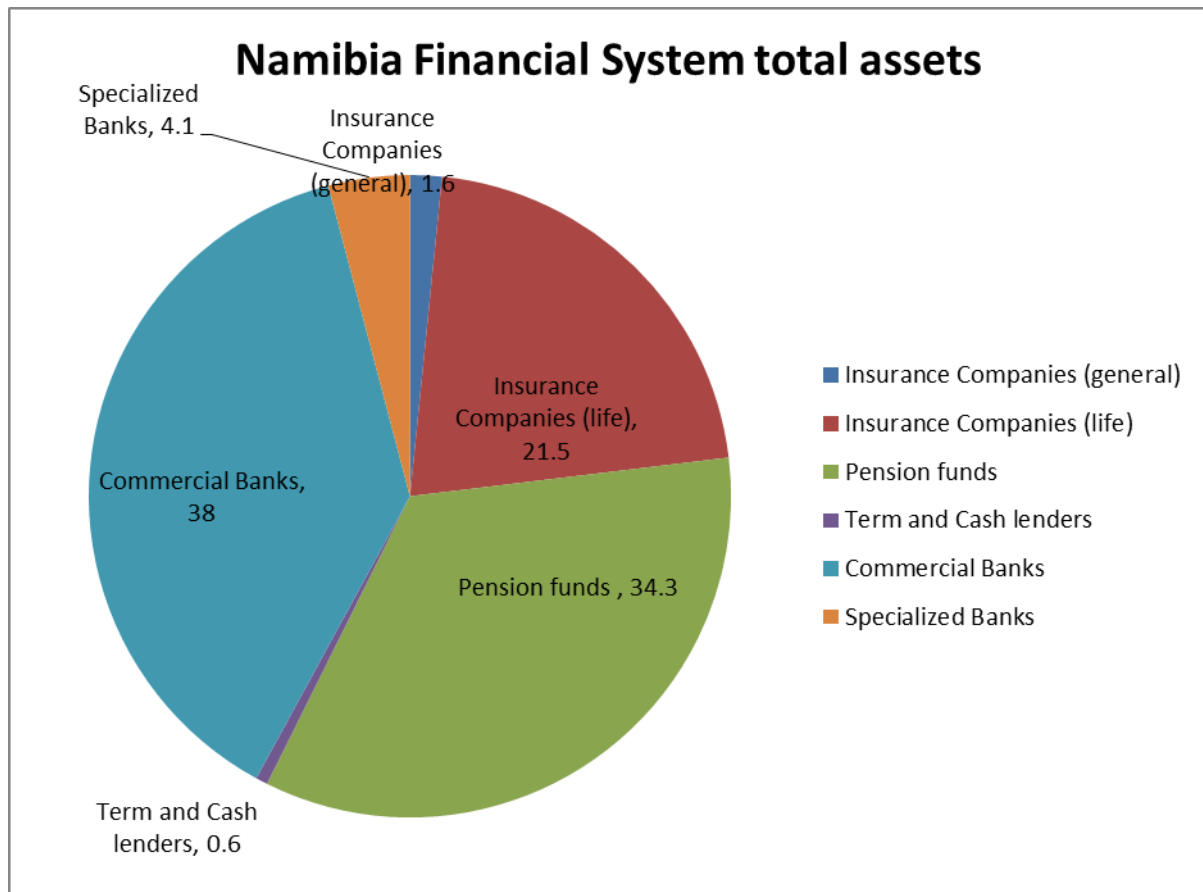
Figure 2.1: Total Assets of the Namibia Financial System
Source: IMF country report.

The financial market comprises the money market and the capital market. The short-term instruments under the money market include, among others, demand deposits, traveller's cheques, transferable deposits, unit trusts and 32-day accounts. According to the World Bank Group (2012), the ratio of broad money (the sum of currency held by the public, demand, and cheque account deposits and savings deposits) grew from 23 per cent of GDP in 1990 to 52 per cent in 2006. On the other hand, the capital market issues and trades in long-term securities. The Namibia Stock Exchange (NSX) aims to enable, develop, and deepen the capital markets in Namibia by working in partnership with stakeholders in government and the financial sector (NSX, 2012). The

economic contribution of the NSX has remained small. It lists nine local companies with a market capitalisation of barely 10.2 per cent of GDP in 2006 with a market turnover of 1.9 per cent (Beck, Demirgüç-Kunt & Peria, 2008). If the entire financial system is developed, it has the potential to impact positively on savings mobilisation, which in turn would lead to improvements in investment and hence economic growth.

2.3. MONETARY POLICY

The Namibian dollar is fixed to the South African Rand (ZAR) on a one-to-one basis. The fixed currency peg to the ZAR supports the Namibian monetary policy. The fixed peg ensures that the goal of price stability is achieved by importing stable inflation from the anchor country (South Africa). Due to this fixed peg between the two countries, Namibia through a discretionary approach towards monetary policy deviates from the policies of the anchor country to affect domestically induced inflation. The discretionary approach gives room to handle unexpected structural breaks in the economy. This largely justifies why the ultimate goal of Namibia's monetary policy is to ensure price stability in the interest of sustainable growth and development rather than targeting the exchange rate regime. Since the introduction of the Namibia dollar in 1992 and the signing of the bilateral Monetary Agreement with South Africa, Namibia has maintained a cautious approach to monetary policy (Sherbourne, 2013).

2.4. TREND ANALYSIS OF THE KEY VARIABLES IN THE STUDY

This section provides trend analyses for the three key variables in the study with the intention of establishing how they are related and how they relate to each other. Figure 2.2 below presents the trend of each variable over time with savings rising gradually from 1990 to 2002 and then declining sharply in 2003, rising in 2004 to 2006. From 2007 to 2009, savings fall sharply to attain a low of about 4 billion. The fall from 2007 to 2009 is mainly attributed to the increases in world food and oil prices and the onset of the global economic crisis, which led to the global recessions in the world economies. However, after 2009 Namibia adopted expansionary monetary and fiscal policies. The expansionary monetary policy was implemented through the gradual reduction of the repo rate, which was reduced from a high of about ten per cent in 2008 to about five per cent by the end of 2011. On the other hand, expansionary fiscal policy was implemented through the use of the Medium Term Expenditure Framework (MTEF) and the targeted intervention programme for employment and economic growth (TIPEEG) (National Planning Commission, 2012; Malumo, 2012). In general, the trend for savings was upward sloping throughout the period 1990 to 2013. Figure 2.2 also shows that both the gross domestic product and the gross fixed capital formation were on an upward trend for the entire period except 2008, when they both fell, albeit slightly, due to the escalation of the world food and oil prices and the onset of the global economic crises as explained earlier on.

Figure 2.2: Trend diagrams of the variables

Source: World Bank, 2014; Namibia Statistical Agency, 2014.

Figure 2.3 attempts to compare savings, investment and the gross domestic product in the diagram. The behaviour of the variables is still the same as explained above. The figure explicitly indicates that all three the figures have upward trends and that savings in Namibia is lower than the gross fixed capital formation, which in turn is lower than the gross domestic product. If savings, investment and economic growth have a strong linear relationship, they are all supposed to increase when one of them increases. However, not all savings are invested because a greater proportion may be used to smoothen consumption. A closer look at Figure 2.3 shows that the three variables move together. Gross fixed capital formation seems to trace movement in savings. For instance, in 2003 and 2009 where savings dropped the investment rate declined as well. Though gross domestic product is trending far above saving and investment curves, its movement also reflects trends in savings and investment. Overall, the fact that all three the curves are upward sloping suggests that there might be a strong linear relationship between them.

Figure 2.3: Comparison of the trend diagrams of the variables

Source: World Bank, 2014; Namibia Statistical Agency, 2014.

Figure 2.4 and Figure 2.5 show the growth rates of savings, investment and economic growth and a comparison of the growth rates in one diagram. These growth rates indicate that savings growth rates are more volatile than those of investment, which in turn are more volatile than those of economic growth. Savings appear more volatile after 2003 and investment fluctuates about the zero mark for the entire period and also appears to be more stable. Gross domestic savings appear to be more volatile after 2003. From the two diagrams (Figure 2.4 and Figure 2.5), it is observed that the growth rates of the gross domestic product are smaller than the growth rates of investment, which in turn are smaller than the growth rates of savings. From Figure 2.5 it is evident that there is a strong relationship between the growth rate of saving and the growth rate of investment. It is clear that if savings growth rises, so will investment growth and *vice versa,* and economic growth rate will then follow the movements of these two variables.
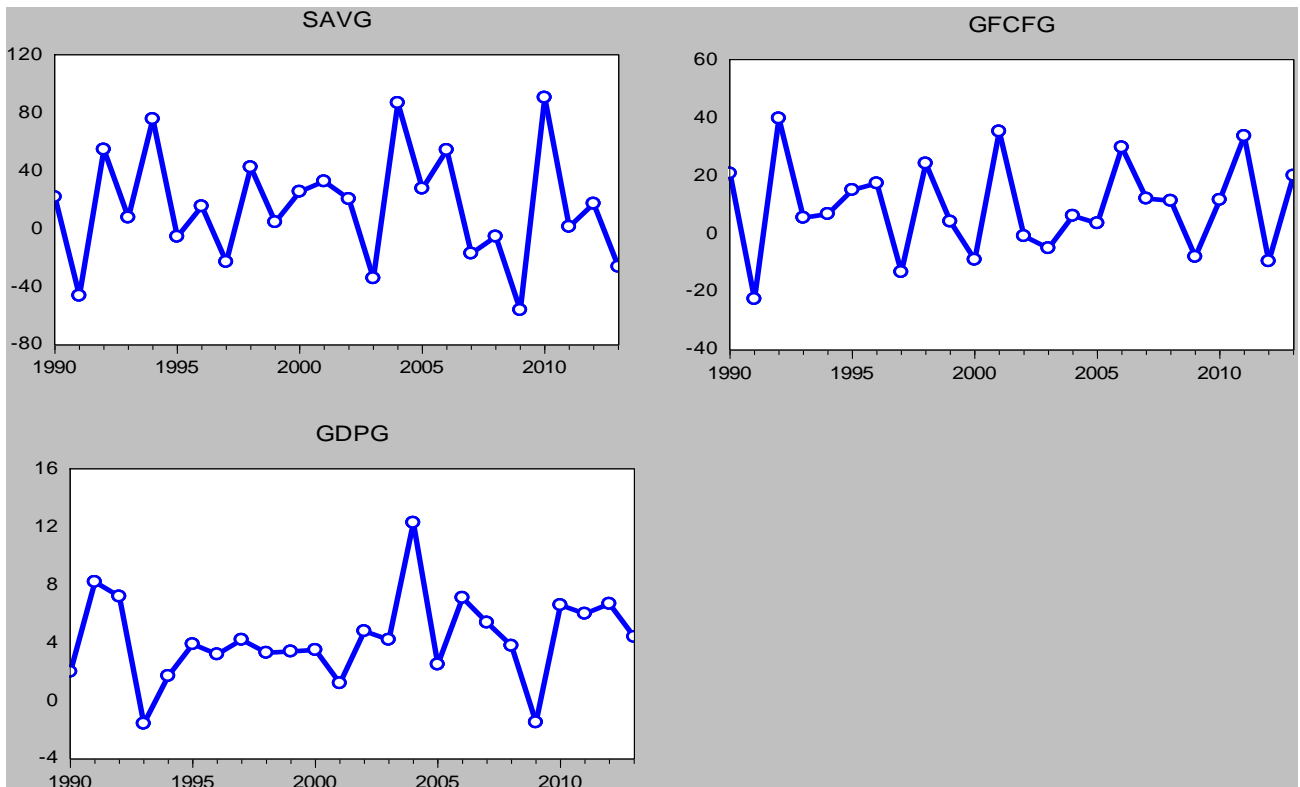
Figure 2.4: Trend diagrams of the growth rates of the variables

Source: World Bank, 2014; Namibia Statistical Agency, 2014.
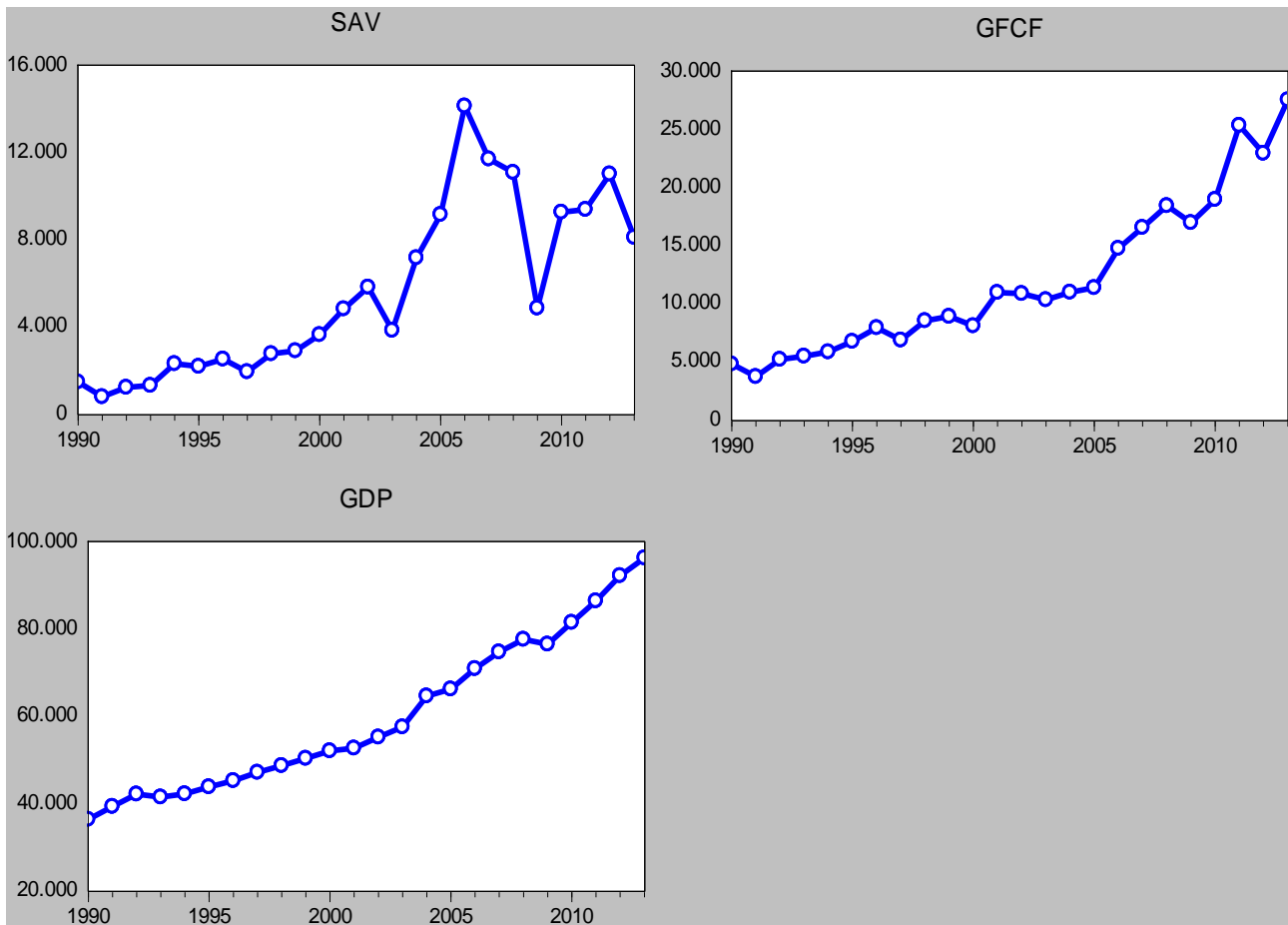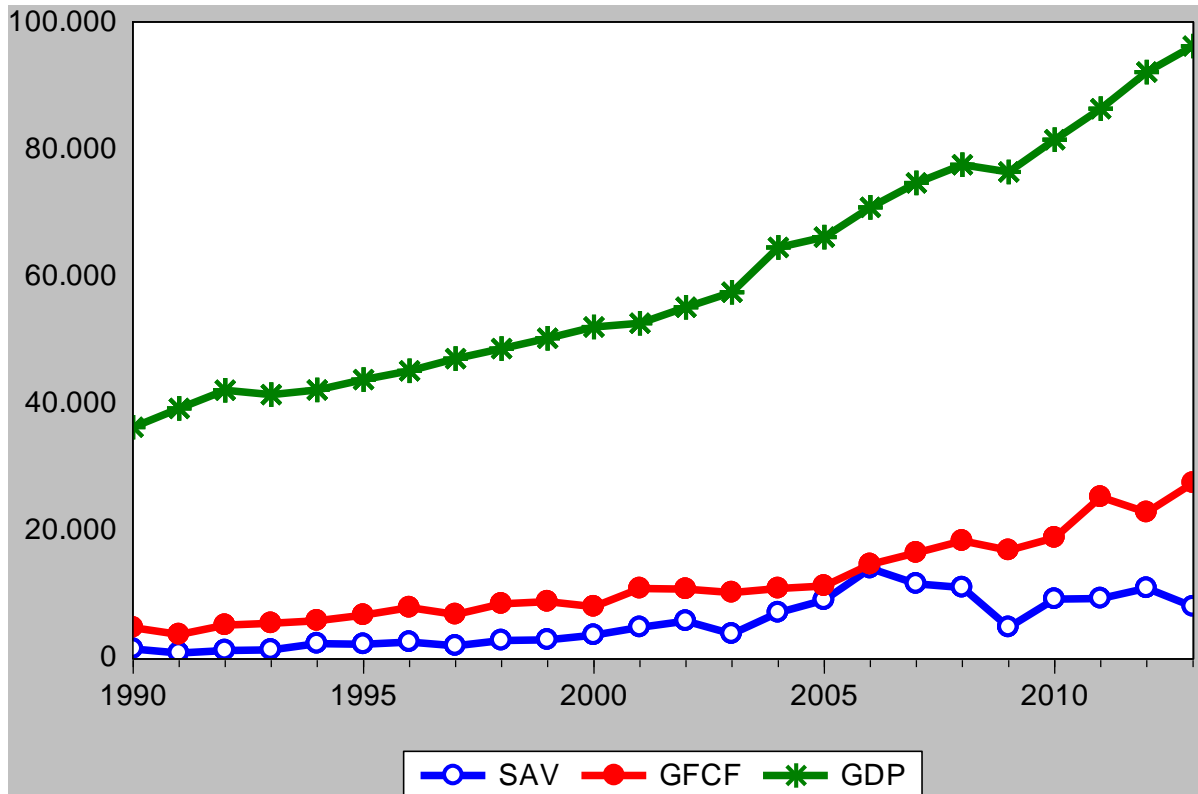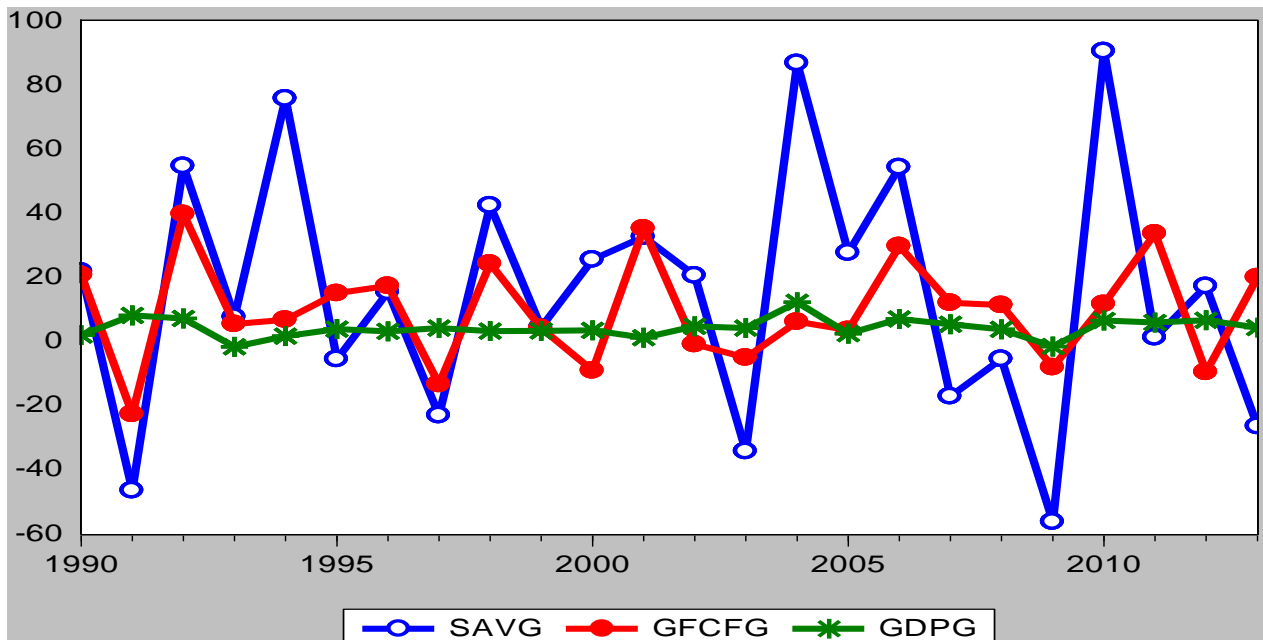

Figure 2.5: Comparison of the trend diagrams of the growth rates of variables

Source: World Bank, 2014; Namibia Statistical Agency, 2014.

Figure 2.6 attempts to compare the saving rates and the deposit rates in Namibia to see if there are any discernible patterns between the two variables. From theory, it would be logical that

savings mobilisation increases when the deposit rates increase and *vice versa*. The diagram indicates that there appears to be no clear-cut relationship between the movements of savings and deposit rates in Namibia except in the years where the relationship appears coincidental, such as 2004, and 2008 to 2012. This is because interest rate is not the only determinant of savings. Other factors such as income level, occupation, the level of education and other forms of non-financial savings also influence saving. In addition, saving is a habit that needs to be developed; even with rising income levels and booming economic activities, people may not save if the habit to save is lacking. Therefore, one can only save when the present consumption demand has been met satisfactorily.
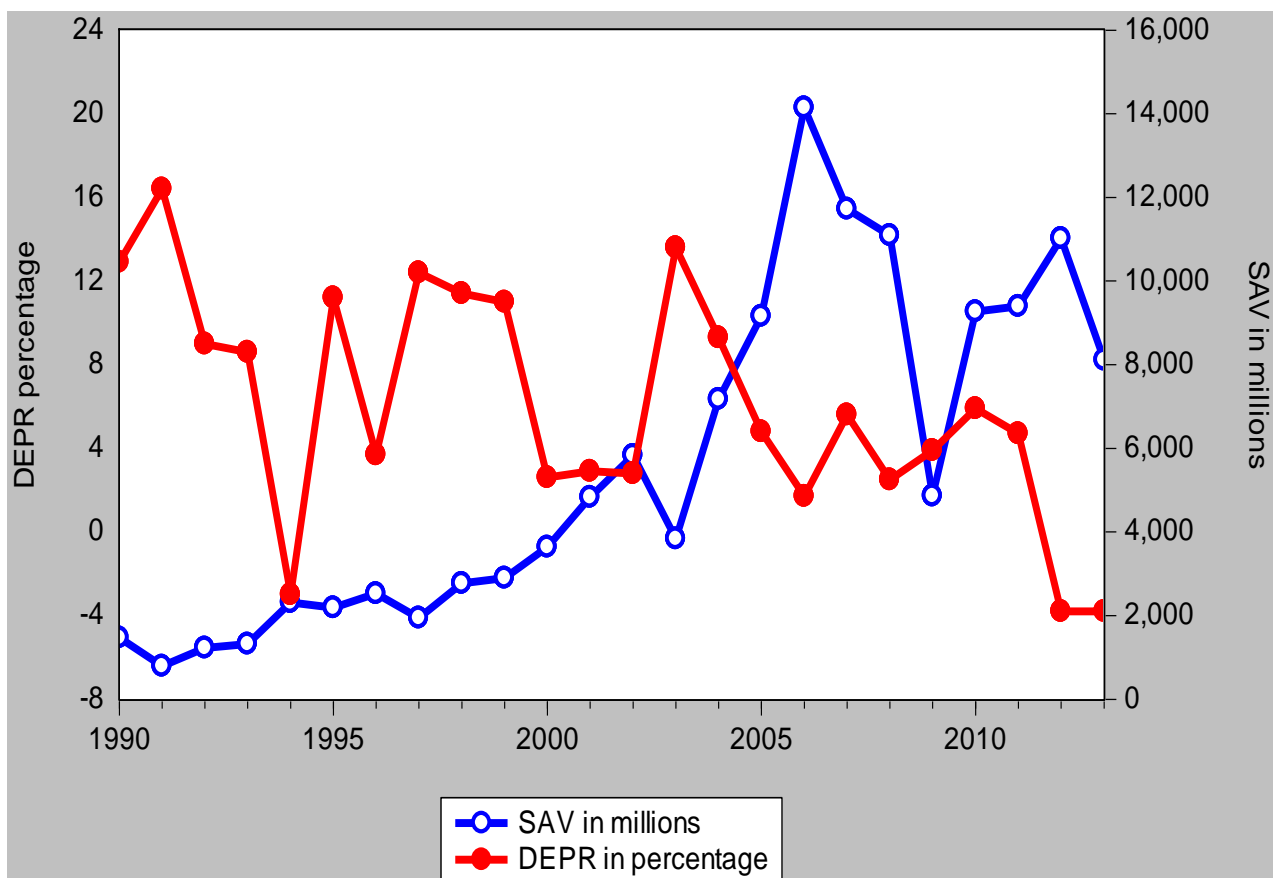
Figure 2.6: Savings and the deposit rates

Source: World Bank, 2014; Namibia Statistical Agency, 2014.

2.5. CONCLUSION

The chapter has provided a background of the Namibian economy concerning the key variables used in the current study. In addition, the chapter has provided a brief overview of the financial system of Namibia, which consists of three sectors, namely the formal financial sector, the semi-formal financial sector, and the informal financial sector that is typical of other African financial systems. Finally, the descriptive analysis suggests that savings, investment and GDP are likely to

co-integrate and this observation is drawn from the positive trends over time. Thus, we predict a positive relationship between the three variables and this forms the *a priori* expectation of the empirical analysis.

CHAPTER 3
LITERATURE REVIEW

3.1. INTRODUCTION

This chapter presents the literature analysis related to the relationship between savings, investment and economic growth. The chapter is divided into two parts, namely theoretical literature and empirical literature reviews. The theoretical literature discusses the theoretical information pertaining to the relationship between savings, investment and economic growth. The empirical literature review summarises the studies on the relationship between savings, investment and economic growth that used a range of methodologies. The last part of the review of empirical literature relates to studies that used the methodology that we employed in the current study and also the studies that relate to the Namibian economy.

3.2. THEORETICAL LITERATURE REVIEW

Several theoretical frameworks have been developed to explain the relationship between savings, investment and economic growth. This section will focus on the Harrod-Domar model, which is one of the earliest theories, and the McKinnon and Shaw (1973) financial liberalisation hypothesis. These two theories formed the theoretical framework of the study. The next section presents the Harrod-Domar model.

3.2.1. The Harrod-Domar Model

In most growth theories, the relationship between savings and growth implies that higher savings rates lead to faster capital accumulation and faster growth. The theoretical foundations of the relationship between savings and growth can be traced to the initial growth models of Harrod (1939) and Domar (1946), which supposed that output Y was proportional to the capital, $Y = AK$ where A is a constant and implies that growth rate of output would be proportional to the investment and savings rate. The bulk of the information discussed in this section is derived from Warman and Thirlwall (2007).

Formally,

$$dY/dt = AdK/dt = AsY \qquad\qquad [1]$$

(where, $s = (dK/dt)/Y$ is the investment rate, assumed to equal savings rate)

So that, $Growth = (dY/dt)/Y = As \qquad\qquad [2]$

In a two-factor growth model, labour per unit of output is added in a full employment economy with labour growing at an exogenous rate. Since the labour requirement is a binding factor in the context of developing countries like Namibia, which often have unconstrained supplies of unskilled labour and a limited supply of skilled labour, growth would be proportional to the savings rate. Therefore, Rostow (1960) emphasised that a higher rate of savings would lead to higher economic growth. On the other hand, Solow's (1956) celebrated growth model, which assumes decreasing marginal returns to capital and allows substitution between capital and labour, concludes that growth eventually stops but the economies with a higher savings rate enjoy a higher steady state income (though not growth). The endogenous growth models (Romer, 1986; Lucas, 1988), which return to the Harrod-Domar assumptions of constant returns to capital implied in Equation 1, again conclude that higher savings and investment rates lead to a higher growth rate of output. Thus, growth theories imply that higher savings rates should lead to higher growth rates, at least if the economy is below the steady state rate of output.

Nevertheless, consumption theories frequently suggest that a greater growth rate of income (or output) determines the level of savings. For instance, the permanent income hypothesis and life-cycle hypothesis suppose that growth of income (present as well as anticipated) determines the level of consumption and, as expected, affects the level of savings. In support of this notion, Modigliani and Papademos (1975) contend that income growth renders the young richer than the old. Therefore, under the life-cycle hypothesis, the young save more in their youth and then dis-save when they are old, so that a positive correlation between savings and growth can be anticipated. Similarly, Deaton and Paxson (2000) explain the motives for savings with growing income up to retirement age in their finite-life version of permanent income hypothesis. On the other hand, Carroll and Weil (1994) contend that an exogenous upsurge in the aggregate growth makes consumers feel better off, resulting in more consumption and less savings. This means that the impact of an increase in savings could be negative if the consumption habits increase with growing income. Nevertheless, if the consumption habits change sluggishly in response to increasing income, a greater fraction of increased income may be saved, causing higher savings with greater income (Carroll & Weil, 1994). Consequently, consumption theories propose that it is income growth that determines the savings rate, even though the direction of the effect of income growth on savings rate is contentious.

3.2.2. McKinnon's Model of Economic Growth

In this section, we now link the theory of financial liberalisation to the process of economic growth by testing for Namibia with some modifications to McKinnon and Shaw's (1973) virtuous circle model of economic growth in which the effects of financial variables are highlighted. According to Warman and Thirlwall (2007), the model is as follows:

Real output (Y) is a function of the stock of capital (K)

$$Y = \sigma K \qquad [3]$$

where σ is the productivity of capital. Saving (S) is assumed to be a fixed proportion of real output, which in equilibrium is equal to investment (I):

$$S = sY = dK/dt = I \qquad [4]$$

where s is the propensity to save. The growth rate (g) is obtained by differentiating [3] with respect to time and substituting in [4], which yields the Harrod-Domar result:

$$g = \sigma s \qquad [5]$$

Warman and Thirlwall (2007) added that the propensity to save is itself assumed to be partly determined by the growth of output together with the real rate of interest offered on deposits (r) and some other variables (z):

$$s = s(g, r, z) \qquad [6]$$

Substituting [6] into [5] gives:

$$g = \sigma s(g, r, z) \qquad [7]$$

The dependence of savings on growth is what McKinnon and Shaw (1973) call the 'portfolio effect', which then generates a virtuous circle in which there is an interdependence between saving and growth: $dg/ds > 0$, and $ds/dg > 0$. A higher growth rate requires a higher savings ratio in order for the ratio of money balances to income to remain at a constant level. As McKinnon and Shaw (1973) put it, the public are induced not to consume all of their incremental income because they want their asset position to rise commensurately. Their propensity to save out of income is thereby increased (McKinnon & Shaw, 1973: 124). The effect of growth on the propensity to save depends in turn on the financial conditions of the economy. The more developed the financial system, the higher the financial assets-income ratio is likely to be, and the higher the propensity to save. For the portfolio effect to influence the rate of economic growth, a developed and healthy financial sector is needed, including a positive real interest rate offered on deposits, so that the public is attracted to hold its saving in the form of financial assets. The economy reaches an equilibrium rate of growth when the actual rate of growth of output generates desired savings sufficient to support the investment necessary to maintain that rate of growth. For the model to have a stable equilibrium solution, it can be shown that the portfolio effect of growth on savings (ds/dg) must be less than the capital-output ratio $(1/\sigma)$ (McKinnon & Shaw, 1973: Ch. 9).

Introducing additional explanatory variables into the savings propensity function as part of the other variables; we include export performance and foreign capital inflows:

$$s = s(g, r, x, s_F) \tag{8}$$

where x is the rate of growth of exports and s_F is the ratio of foreign saving to income. Both export growth and foreign saving relieve the foreign exchange constraint on investment and growth, therefore influencing savings behaviour. Papanek (1973) has argued that export performance affects positively the propensity to save through the income distribution. Exports tend to produce highly concentrated incomes in developing countries, with a high propensity to save attached. Moreover, export earnings are administratively easier to tax than wages or profits, thus increasing public saving as well. Let us now solve the model, distinguishing between private, public and foreign saving:

Let private saving (PS) be a function of real income (Y):

$$PS = sY \tag{9}$$

moreover, substituting equation (8) into equation (9) in linear form gives:

$$PS = (\phi_1 g + \phi_2 r + \phi_3 x + \phi_3 s_F)Y \tag{10}$$

From the national accounts, we have:

$$S = I + (X - M) \tag{11}$$

and,

$$S = PS + P_u S = PS + (T - G) \tag{12}$$

where S is total saving; X is exports; M is Imports; P_u S is public saving; T is tax revenue, and G is government expenditure.

From equations [11] and [12] we have:

$$I = PS + (T - G) + (M - X) \tag{13}$$

that is, the sources of finance for investment are private saving, public saving and foreign saving equal to the difference between imports and exports.

Substituting [9] into [13] gives:

$$I = sY + (T - G) + (M - X)$$ [14]

Differentiating [3] with respect to time and substituting $I = dK/dt$ from [4] we get:

$$\frac{dY}{dt} = \sigma I$$ [15]

Substituting [14] into [15]:

$$\frac{dY}{dt} = \sigma [sY + (T - G) + (M - X)$$ [16]

and dividing through by Y gives:

$$g = \sigma [s + s_G + s_F)$$ [17]

where s_G is the public savings ratio and s_F is the foreign savings ratio.

This analysis shows how savings, investment and economic growth influence each other and the fact that the choice to study these variables in the current study is backed by theory and not by coincidence (Warman & Thirlwall, 2007). Other theories could have been discussed; however, the ones discussed appear to clearly illustrate the relationship between savings, investment and economic growth and make some good practical recommendations.

3.3. EMPIRICAL LITERATURE REVIEW

3.3.1. Empirical literature on Namibia

Shiimi and Kadhikwa (1999) investigated the effect of savings and investment in Namibia using cointegration and ECM to determine the long and short-term impacts of determinants of saving and investment in Namibia. Their results reveal that private saving in Namibia is only significantly influenced by real income, while bank deposit rates exert little, if any, influence. Additional, factors such as real lending rates, inflation and real income and government investments are important determinants of investments in Namibia. The study also revealed that Namibia's savings level has been satisfactory by international standards, but the investment performance has been disappointing, resulting in a slower economic growth than expected. Their study concluded that while the poor performance of investment is attributable to many different dynamics, the scarcity of skilled labour is a key problem that must be addressed as a priority for Namibia to achieve higher growth targets in future.

Ogbokor and Samahiya (2014) carried out a study on the determinants of savings in Namibia using a cointegration and error correction method for the period 1991 to 2012. The study made use of quarterly macroeconomic data sets. The article relied heavily on unit root tests, cointegration and error correction procedures. The results of the cointegration tests suggest that there is a long-run relationship between savings and the explanatory variables (gross domestic income, inflation rate, deposit rate, broad money supply and population). The results suggest that inflation and income have a positive impact on savings, whilst population growth rate has negative effects on savings. The results further show that deposit rate and financial deepening have no significant effect on savings. Additionally, the results re-enforce the work by Shiimi and Kadhikwa (1999).

3.3.2. Literature from the rest of Africa

Elbadawi and Mwega (2000) also carried out a study entitled 'Can Africa's savings collapse be reversed?' The article analysed the determinants of private saving in Sub-Saharan Africa, and sought to explain the region's poor performance and identify policies that could help to reverse the region's decline in saving. The analysis showed that in Sub-Saharan Africa causality runs from growth to investment (and perhaps to private saving), whereas a rise in the saving rate Granger-causes an increase in investment. Foreign aid was found to Granger-cause a reduction in both saving and investment, and investment Granger-cause increases in foreign aid.

On the other hand, Ogwumike and Ofoegbu (2012) scrutinised the effect of financial liberalisation on domestic saving in Nigeria from 1970 to 2009. The study employed the Autoregressive Distributed Lagged (ARDL) model built on the McKinnon-Shaw hypothesis. The findings of the study revealed that the increase in interest rate on deposit brought by liberalisation was not the main determining factor that influences depositors to save or raise savings but the absence of investment alternatives outside financial assets. Additionally, the study found that lack of effective competition among banks repressed the effect of interest rate liberalisation on savings in Nigeria.

Larbi (2013) explored the determinants of private savings in Ghana, using the Phillips and Ouliaris (1990) residual-based tests for cointegration to determine the long-run relationship between private savings and its determinants. The study found that financial liberalisation, per capita income and inflation have a positive and significant relationship with private savings. The study also found a positive and significant coefficient of the fiscal deficit variable and this confirms the fulfilment of the Ricardian Equivalence[1] hypothesis in Ghana. This implies that there is a strong willingness to save but the capacity to save is not there. The study recommends that financial liberalisation needs to be deepened to provide financial institutions opportunity to improve financial packages for

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[1] Defined as an economic theory that suggests that when a government tries to stimulate demand by increasing debt-financed government spending, demand remains unchanged.

increased savings. In addition, growth of the economy should be followed strongly to increase incomes and therefore people's capacity to save.

On a different note, Fedderke and Romm (2003) used Johansen VECM estimation techniques to study the nexus between savings and growth in South Africa for the period of 1946–1992. The results indicate that private saving rate has a direct and indirect effect on growth. The indirect effect is through the private investment rate, while growth has a positive influence on private saving. This means that economic growth promotes saving and savings in turn enhance economic growth through the investment channel.

3.3.3. Literature from the rest of the world

Theoretical literature suggests that domestic savings play a central role in enhancing investment and hence promoting economic growth. Following this theoretical prediction, Hofmann, Peersman and Straub (2012) examined the determinants of private and public savings in 36 Latin American countries from 1990 to 2011, using cointegration and error correction methodology. They found that the per capita income is the most important determinant of private savings, along with the demographic structure, social security expenditure and the depth of the financial sector. Larbi (2013) also found a strong positive relationship between savings and income in Ghana. In addition, he found that public savings are less affected by these factors. However, real growth and foreign savings influence both private savings and public savings. Sinha and Sinha (1998) investigated the relationship between GDP and saving in India for the period 1950-1993 and found that both gross domestic saving and gross domestic private saving cointegrate with GDP. Sinha and Sinha (1996) argue that causality tests between growth of gross domestic saving and the growth is bi-directional, implying that savings cause growth and also that economic growth causes savings to increase. Agrawal (2001) investigated the relationship between savings, investment, and growth in South Asia for the period of 1950–1998 and found a unidirectional causality from savings to economic growth in Bangladesh and Pakistan, and a unidirectional causality from economic growth to savings in India, Sri Lanka, and Nepal.

Agrawal and Sahoo (2009) explored the long-run determinants of total and private savings and the direction of causality between savings and growth in Bangladesh over 1975–2004, and found that total savings rate is determined by GDP growth rate, dependency ratio, interest rates and bank density. In addition, the authors argue that the private savings rate was affected by the public savings rate. Besides, after using the Granger Causality tests, Agrawal and Sahoo (2009) found a bi-directional causality between savings and growth.

Rasmidatta (2011) investigated the link between domestic saving and economic growth in Thailand, using the Granger causality test for annual data from 1960 to 2010. The findings indicated that the direction of causality runs from economic growth to domestic saving.

Ang (2011) carried out a study entitled "Savings mobilisation, financial development and liberalisation: the case of Malaysia". This study attempted to establish the key factors behind Malaysia's remarkable savings performance. Using the life-cycle theory, the saving function was estimated by incorporating other important structural aspects and institutional settings of the Malaysian economy into the specification. The study placed particular emphasis on the roles of financial factors in mobilising financial resources in the private sector. The results established that financial deepening and increased banking density tend to encourage private savings. Lastly, the study established that development of insurance markets and liberalisation of the financial system conversely tends to apply a dampening effect on private savings.

Fry (1997) studied saving, investment, growth and financial distortions in Pacific Asia and other developing areas. His study estimated a simultaneous-equation model in which the real deposit rate of interest and the black market exchange rate premium affect saving, investment, export growth and output growth. Because output growth rate is a major determinant of saving, he found that saving is influenced substantially, even though indirectly, by financial distortions through their effects on investment, export growth, and output growth. The simulations he conducted indicated that variations in the average values of the financial distortion variables explain approximately 50 per cent of the difference in saving ratios and 75 per cent of the difference in output growth rates between five Pacific Asian countries and 11 countries in other developing areas.

Fry (1998) also carried out a study entitled "Money and capital or financial deepening in economic development". The results obtained indicate that the real rate of interest has a positive influence on economic growth and domestic saving in the Asian LDCs. Therefore, McKinnon and Shaw's (1973) argument on the significance of financial conditions in the development process is fully vindicated. The demand for money estimates found by Fry, nevertheless, do not corroborate McKinnon and Shaw's (1973) complementarity hypothesis, which is based on the assumption that investment is principally self-financed, and money is the predominant financial repository of domestic savings in these countries. It is noteworthy that the Asian LDCs used in the study had achieved stages of financial development higher than the phase in which the complementarity assumptions might hold. These LDCs have significantly sophisticated, non-institutional as well as modern institutional financial systems. Furthermore, this study found that differentiation of financial assets has occurred, in part, because of deliberate interventionist policies in these countries.

Agrawal and Sahoo (2008) carried out a study entitled "Savings and growth in Bangladesh". Their study found that savings and growth are strongly correlated. The study specifically wanted to find

out the determinants of savings and to determine the direction of causality between savings and growth, since these have important implications for macroeconomic and development policy. The paper estimated the long-run total and private savings functions for Bangladesh using cointegration and error correction methodology. The study found that the determinants for the total savings rate are GDP growth rate, interest rates, dependency ratio and bank density. The study further established that private savings rate is also influenced by the public savings rate. Further, the Granger causality tests indicated that there is a bi-directional causality between savings and growth in Bangladesh. The forecast error variance decomposition (FEVD) analysis using the VAR framework confirms the causality results obtained using the Granger causality tests as well as the estimated savings functions.

Warman and Thirlwall (2007) investigated the argument that rising real interest rates induce more saving and investment and therefore act as a positive stimulus to economic growth for the period 1960 to 1990. Their results showed that financial saving has a positive relationship with real interest, but total saving did not change with real interest rates. The study also found that investment is positively associated with the supply of credit from the banking sector. However, the net effect of interest rates on investment was found to be negative. Using McKinnon and Shaw's (1973) 'virtuous circle' model of economic growth, the study shows that interest rates do not favourably influence economic growth in Mexico. The study therefore concluded that any favourable effect of financial liberalisation and higher real interest rates on economic growth must come through increases in productivity of investment.

Marashdeh and Al-Malkawi (2014) carried out a study entitled "Financial deepening and economic growth in Saudi Arabia" for the period 1970 to 2010. This paper aimed to examine the relationship between financial deepening and economic growth in one of the major emerging economies. The study employed the autoregressive distributed lag approach to cointegration. The financial depth or size of the financial intermediaries' sector was measured by the monetisation ratio (M2/GDP). The results showed a positive and statistically significant long-run relationship between financial deepening, as measured by M2/GDP, and economic growth, as measured by gross domestic product (GDP) per capita growth. In the short run there is no statistically significant relationship between these variables. Largely, the results support the supply-leading hypothesis that financial deepening spurs economic growth in Saudi Arabia in the long run.

Shan and Morris (2002) carried out a study entitled "Does financial development lead to economic growth". Their study used the Toda and Yamamoto (1995) causality testing procedure to investigate the relationship, if any, between financial development and economic growth. They used quarterly data from 19 Organisation for Economic Co-operation and Development (OECD) countries and China, and used total credit and interest spread as indicators of financial

development. They also considered the impact of financial development on investment and productivity. They found small evidence to support the view that financial development leads to economic growth either directly or indirectly. This result casts further doubt on claims that financial development is a necessary and perhaps sufficient precursor to economic growth.

Tang and Ch'ng (2012) used multivariate analysis to study the relationship between the associations of Southeast Asian countries with the main objective to revisit the savings growth relationship. They used annual data from 1970 to 2010 in the re-examination and found that savings have a long-run relationship with economic growth and development. Bootstrap experiment was also used to determine the direction of causality between economic growth and savings and the results show that economic growth Granger caused savings in all the ASEAN-5 countries. The results therefore concluded that savings is a prominent source for economic growth in the five ASEAN countries.

3.4. CONCLUSION

The theoretical literature suggests that there is a relationship between savings, investment and economic growth. In other words, savings affect investment, which in turn affects economic growth. The two major theories that were discussed are the Harrod-Domar and the McKinnon and Shaw theories that attempt to explain the connection among these three variables. The results from Namibia reveal that private saving is only significantly influenced by real income, while bank deposit rates exert little, if any, influence. Additional factors such as real lending rates, inflation and real income and government investments are important determinants of investments in Namibia. The studies from Africa and the rest of the world generally indicate that savings cause investment to grow and hence stimulate economic growth. In addition, some of the studies found a bidirectional relationship between savings and investment and economic growth. The next chapter discusses the methodology employed in the current study.

CHAPTER 4

THE RESEARCH METHODOLOGY AND VARIABLE DEFINITIONS AND SOURCES

4.1. INTRODUCTION

This chapter discusses the methodology employed to examine the relationship between domestic saving mobilisation, investment and economic growth in Namibia. The chapter also discusses the sources of data and defines the variables used in the estimation. The remainder of the chapter is organised as follows: section 4.2 discusses the data sources and section 4.3 presents the vector auto-regression methodology. Section 4.5 specifies the model and section 4.5 discusses stationarity and the diagnostics tests of the VAR. Finally, section 4.6 draws the conclusion for the chapter.

4.2. DATA SOURCES AND DEFINITION OF VARIABLES

The data employed in the study were sourced from the Bank of Namibia and the Namibia Statistics Agency. The sample period was from 1990 to 2013. The period initially chosen for the study was 1980 to 2013, but because of incomplete data points for some of the variables such as savings the period had to be shortened to 1990 to 2013, where the data is complete for all the variables.

4.3. DEFINITIONS OF VARIABLES

4.3.1. Savings (SAV)

Savings refers to both domestic and international savings and the base year for this variable is 2005. Savings are expected to be positively related to both investment and gross domestic product. In other words, the higher the savings, the higher should be investment and economic growth. The data for savings was sourced from the Namibia Statistical Agency database (NSA, 2014).

4.3.2. Investment or Gross Fixed Capital Formation (GFCF)

This is gross fixed capital formation expressed in real terms and in millions of local currency with a base year of 2005 dollars. Investment growth is also expected to be positively related to saving and real gross domestic product. The data for investment was sourced from the NSA (2014) database. Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings and commercial buildings (NSA, 2014).

4.3.3. Real Economic Growth (GDP)

Real gross domestic product (GDP) is defined as nominal GDP in local currency units (LCU) adjusted for inflation, which is found as a ratio of GDP in local currency units and the CPI. Increasing real gross domestic product is expected to spur the growth in both savings mobilisation and investment. This data is available in the NSA (2014) database and World Bank Statistical Data (2015).

4.4. THE VAR METHODOLOGY

To examine the relationship between savings, investment and economic growth, the study adopted the VAR econometric technique propounded by Sims (1980). Sims (1980) defined VAR as a vector of endogenous variables regressed against their lags and the lags of the other variables included in the model. VAR models are considered when modelling simultaneous equations rather than focusing on single equations.

In a VAR model there is an *n*-equation and *n*-variable linear model in which each variable is in turn explained by its own lagged values, plus current and past values of the remaining *n*-1 variables. The technique provides a systematic way to capture the dynamics in multiple time series (Stock & Watson, 2001). Although quarterly data provides a larger sample size and better results than annual data, the current study employed annual data covering the period from 1990 to 2014 simply because quarterly data was not available. The descriptions of various variables used in the model as well as their data sources are presented in this chapter.

4.5. MODEL SPECIFICATION

4.5.1. The VAR Model specified

The general VAR model utilised in this study is specified as follows in a system of five equations:

$$SAV = f(GFCF, GDP, SAV) \qquad\qquad\qquad [4.1]$$

$$GDP = f(GFCF, GDP, SAV) \qquad\qquad\qquad [4.2]$$

$$GFCF = f(GFCF, GDP, SAV) \qquad\qquad\qquad [4.3]$$

Where SAV = savings

GDP = real gross domestic product

$GFCF$ = investment

The VAR model in a specific form is presented as shown below and the variables are converted into natural logarithms. Logarithms have some benefits in estimation as they smooth out data in

comparison to unlogged data and the parameter estimates resulting from an estimated equation are elasticities (Lewis & Mizen, 2000). If the VAR variables are cointegrated the VAR is converted to a VECM, which is then estimated.

$$LNSAV_t = \alpha_1 + \sum_{i=1}^{p} \beta_{11}^i LNGFCF_{t-i} + \sum_{i=1}^{p} \beta_{12}^i LNGDP_{t-i} + \sum_{i=1}^{p} \beta_{13}^i LNSAV_{t-i} + \varepsilon_t^{LNSAV} \qquad [4.4]$$

$$LNGDP_t = \alpha_2 + \sum_{i=1}^{p} \beta_{21}^i LNGFCF_{t-i} + \sum_{i=1}^{p} \beta_{22}^i LNGDP_{t-i} + \sum_{i=1}^{p} \beta_{23}^i LNSAV_{t-i} + +\varepsilon_t^{LNGDP} \qquad [4.5]$$

$$LNGFCF_t = \alpha_3 + \sum_{i=1}^{p} \beta_{31}^i LNGFCF_{t-i} + \sum_{i=1}^{p} \beta_{32}^i LNGDP_{t-i} + \sum_{i=1}^{p} \beta_{33}^i LNSAV_{t-i} + +\varepsilon_t^{LNGFCF} \qquad [4.6]$$

4.5.2. Selecting the lag length

To conduct cointegration analysis, the first step that needs to be taken to establish the maximum lag length for a VAR. The importance of Lag length selection in a VAR specification is that choosing a smaller number of lags lead to model misspecification and using too many lags leads to a needless loss of degrees of freedom. To circumnavigate this problem, one should use statistical tests such as the modified Likelihood Ratio (LR) test, Hannan-Quinn Information Criterion (HQ) Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC).

4.5.3. Johansen Cointegration Approach

The Johansen cointegration approach is the next step, employed to estimate the long-run relationship amongst series in the models. To achieve this goal, the study employs the maximum likelihood that is based on cointegration approach coined by Johansen (1992). The later approach is only used after ascertaining if the individual variables have a unit root or not. If the time series variables have the same order of integration, then they may be cointegrated. It should be noted that cointegration deals with the relationship among a group of variables, where each has an unconditional unit root.

The following are the two test statistics for cointegration employed under the Johansen method.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} ln(1-\lambda) \qquad [4.8]$$

$$\lambda_{max} = (r, r+1) = -T\, ln(1-\lambda_{r+1}) \qquad [4.9]$$

Where r represents the cointegrating vectors number considered under the null hypothesis and λ_i is the calculated value of the ith ordered Eigen value from the Π matrix. It should be noted that the larger is λ_i the larger and negative will $ln(-\lambda_i)$ be and therefore, the greater the test statistics will

be when T is the total of the observations. The λ -trace test statistic tests the existence of at least r cointegration vectors against a general alternative, while the null hypothesis of r against r +1 cointegrating vectors is tested by λ_{max}.

4.6. STATIONARITY AND DIAGNOSTIC TESTS

4.6.1. Unit Root Test

The section begins by examining the time series properties of the variables in order to determine the order of integration for the variables used. Some of the techniques used to test for unit roots include the Augmented Dickey Fuller Test (ADF) (Dickey & Fuller, 1979), Perron Phillips (PP) (1990) and Kwiatkowski (Phillips, Schmidt, & Shin, 1992), among others. Stationarity means that over two different time intervals the sample mean and covariance of the time series over the two time intervals is almost the same. Put differently, a time series is stationary if its statistical properties are constant over time.

The Augmented Dickey Fuller test (ADF) (Dickey & Fuller, 1979) is the most common test employed to confirm data stationarity in econometric research. This test is often used in higher order models where the error terms are autocorrelated. First, the order of integration of each of the variables is established, since cointegration entails that the series be integrated of the same order. The study employs the Augmented Dickey Fuller (ADF) unit root testing procedure to test for stationarity of the variables (Dickey & Fuller, 1979). The test helps to establish the size of the coefficient λ that needed to determine the subsequent equation:

$$\Delta Z_t = \alpha_0 + \mu t + \lambda Z_{t-1} + \alpha_i \sum_{i=1}^{n} \Delta Z_{t-i} + \varepsilon_t \qquad [4.7]$$

where: t shoes the time trend and Z is the series of interest that is tested. Accepting the null hypothesis implies that $|\lambda| = 0,$ which would mean the existence of a non-stationary process. The unit root is carried out under the hypothesis:

H_0: series contains a unit root, versus,
H_1: series is stationary

In this case the null hypothesis is rejected if the coefficient of the lag of $Z[\lambda]$ is significantly different from zero which implies that the series is non-stationary.

4.6.2. VAR diagnostics test

The following tests were conducted on the VAR model to see if it is satisfied:

- **VAR stability condition checks**

  The VAR stability condition was justified using the AR Root table and AR Roots graph.

- **Lag order selection**

  The optimal lag length is selected based on the information criteria such as the AIC (Akaike's Information Criterion), FPE (Final Prediction Error), SC (Schwarz Criterion), and the HQ (Hannan & Quinn Criterion). To select the lag order, the study chose the lags established by the majority of the tests mentioned above.

4.7. CONCLUSION

The current chapter has discussed the vector autoregression (VAR) methodology employed in the study. The basics about VAR were discussed and then the VAR that was used in the current study was specified. The diagnostic tests that were used in the study were highlighted. Lastly, the definitions of the variables and the sources of the data used in the study were given. The next chapter presents the discussion and analysis of results.

CHAPTER 5

PRESENTATION AND DISCUSSION OF RESULTS

5.1. INTRODUCTION

This chapter discusses the results obtained in the study. First, the stationarity tests are discussed both graphically and using the Augmented Dickey Fuller and the Phillips Peron tests. Second, the chapter discusses the lag order selection using all the techniques available. Third, impulse response functions and forecast error variance decomposition results are discussed. The last part of the chapter deals with the model's diagnostic tests such as the stability of the model (CUSUM, CUSUM of squares), normality and autocorrelation tests used to corroborate the robustness of the results obtained.

5.2. TESTING FOR STATIONARITY

To test for stationarity the study used the Augmented Dickey Fuller (ADF). The results obtained through the graphical method were substantiated by the use of the Augmented Dickey Fuller test and the Phillips Peron tests in Tables 5.2 and 5.3. Table 5.2 shows that all three the variables are non-stationary in levels using both techniques. Further, Table 5.3 indicates that all the variables become stationary after first differencing using both the ADF and the PP tests. The study therefore concluded that savings and economic growth are clearly integrated of order one I(1), implying that a linear combination of them will produce errors that are stationary [I(0)]. Further, investment is stationary in levels using the trend and constant but it is not stationary using no trend and constant. This led to the assumption that investment is also integrated of order one [I(1)]. The fact that all the variables are integrated of order one implies that this does not create modelling problems of having to use variables with different orders of integration in the same model. In addition, this phenomenon augurs very well for the modelling technique adopted in the current study, which used variables in levels or in their first differences only without mixing variables with different orders of integration in the same model.

Table 5.1: ADF non-stationarity tests in levels and first differences 1990-2013

ADF IN LEVELS		
Variable	**Deterministic terms**	**ADF**
LNSAV	Trend and constant	-2.8265
		(0.2026)
	None	-0.7924
		(0.8771)

Variable	Deterministic terms	ADF
LNGFCF	Trend and constant	-4.9835*** (0.0030)
	None	4.3891 (0.9999)
LNGDP	Trend and constant	-1.6654 (0.7336)
	None	7.0629 (1.0000)
ADF IN FIRST DIFFERENCES		
ΔLNSAV	Constant	-5.6549*** (0.0003)
ΔLNGFCF	Constant	-7.5462*** (0.0000)
ΔLNGDP	Constant	-7.9730*** (0.0000)

() indicates the t-stats, ***, **, * indicates 1%, 5% and 10% level of significance

Source: Author's calculation from Eviews 8.

5.3. LAG LENGTH CRITERIA

The first step in the cointegration test is to determine the appropriate lag length for the VAR. There are several popular criteria for lag length selection. The most popular of these criteria are the sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC) and Hainan-Quinn (HQ). Based on these tests, Table 5.4 indicates that the optimal lag length selected for the savings, investment and economic growth model in Namibia is set at one. All five the criteria indicated in Table 5.4 agree that the lag length should be one. Therefore, all the vector autoregression and structural vector autoregression estimations conducted utilise a lag length of one in a bid to find out the way in which these variables relate with each other.

Table 5.2: VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	5.095653	NA	0.000167	-0.182231	-0.034123	-0.144982
1	65.41468	99.65752*	1.95e-06*	-4.644755*	-4.052323*	-4.495760*

* indicates lag order selected by the criterion

5.4. COINTEGRATION TEST AND IMPLICATIONS

Table 5.3 shows the results of the Johansen cointegration test using the Trace test and the Maximum Eigenvalue test. The results show that there are two cointegrating equations using the Trace test and no cointegrating equations using the Maximum Eigenvalue test. Given this situation, the study assumes that there are two cointegrating equations since the Trace test is deemed more powerful than the Maximum Eigenvalue method. This means that the study specifies and estimates a vector error correction model (VECM) with two cointegrating equations. Therefore, all the analyses and the diagnostic checks done in later sections are based on VECM results.

Table 5.3: Johansen Cointegration test

Trace Test				Maximum Eigenvalue Test			
H_0: rank = r	H_a: rank = r	Statistic	5% critical value	H_0: rank = r	H_a: rank = r	Statistic	5% critical value
r = 0	r=1	33.37192	29.79707	r = 0	r≥1	17.84981	21.13162
r≤1	r=2	15.52211	15.49471	r≤1	r≥2	13.04529	14.26460
r≤2	r=3	2.476821	3.841466	r≤2	r≥3	2.476821	3.841466

The trace test shows 2 cointegrating equations while the Maximum Eigenvalue test no cointegration at the 5% level of significance.

Source: Author's calculation from Eviews 8.

5.5. VEC GRANGER CAUSALITY/BLOCK EXOGENEITY WALD TESTS

VEC Granger causality results indicate that investment Granger causes savings at the 5% level of significance and that economic growth does not individually Granger cause savings. If investment and economic growth are considered collectively, they Granger cause savings at the 10% level of significance. In addition, savings does not Granger cause investment, implying that the Granger causality between investment and savings is unidirectional, running from investment to savings. Economic growth does not Granger cause investment. Collectively, savings and economic growth do not Granger cause investment. The results also show that savings and investment individually and collectively do not Granger cause economic growth.

Table 5.4: VEC Granger Causality/Block Exogeneity Wald Tests

Dependent variable: D(LNSAV)			
Excluded	Chi-square	Degrees of freedom	Probability
D(LNGFCF)	6.753522	2	0.0342
D(LNGDP)	1.367714	2	0.5047
All	8.025086	4	0.0907

Dependent variable: D(LNGFCF)			
Excluded	Chi-square	Degrees of freedom	Probability
D(LNSAV)	3.775246	2	0.1514
D(LNGDP)	0.515700	2	0.7727
All	4.021891	4	0.4031
Dependent variable: D(LNGDP)			
Excluded	Chi-square	Degrees of freedom	Probability
D(LNSAV)	2.989664	2	0.2243
D(LNGFCF)	2.884125	2	0.2364
All	5.888422	4	0.2076

Source: Author's calculation from Eviews 8.

5.6.   IMPULSE RESPONSE FUNCTIONS

It is noteworthy that Table A.1 in the Appendix shows the time series data for the variables used to estimate the VECM model specified.

5.6.1. Responses to a savings shock

Figure 5.1 indicates that a sudden increase in savings leads to an increase in savings and this is expected. In addition, a sudden increase in savings leads to a permanent increase in gross fixed capital formation (investment). This makes theoretical and practical sense in that an increase in savings implies that bank deposits have increased, making it possible for banks to support private sector investment projects. Further, a sudden increase in savings leads to a permanent increase in the gross domestic product, which is the proxy for economic growth in the current study. From both the Harrod-Domar and the McKinnon models an increase in savings in the economy leads to an increase in the investment, which in turn leads to an increase in the level of economic activity and hence economic growth.

5.6.2. Responses to investment shock

Figure 5.1 also shows that a sudden increase in investment leads to a permanent accumulated decrease in savings. From both theoretical and empirical points of view, this adds up because a sudden increase in investment may imply that investment has probably increased at a faster rate than savings are accumulating in the economy, thus this affects savings negatively. Further, a sudden increase in investment leads to an increase in investment and this is what is anticipated to happen. In addition, a sudden increase in investment appears not to have any significant impact on economic growth both in the short and long runs. This may be explained by the magnitude of investment as a proportion of GDP in Namibia. A closer look at the investment figures and GDP figures reveals that investment in Namibia is about a tenth of GDP, which is quite small.

5.6.3. Responses to an economic growth shock

The relationship between investment and economic growth is expected to be a positive one, where if one of these two variables increases the other variable responds by increasing as well. Figure 5.1 indicates that savings generally respond positively to a sudden increase in economic growth, and the response is significant. Further, the response of investment to a sudden increase in economic growth is significant and positive as well. This means that an increase in economic growth spurs investment to increase. Lastly, a sudden increase in economic growth leads to a significant increase in economic growth and this is what is expected.
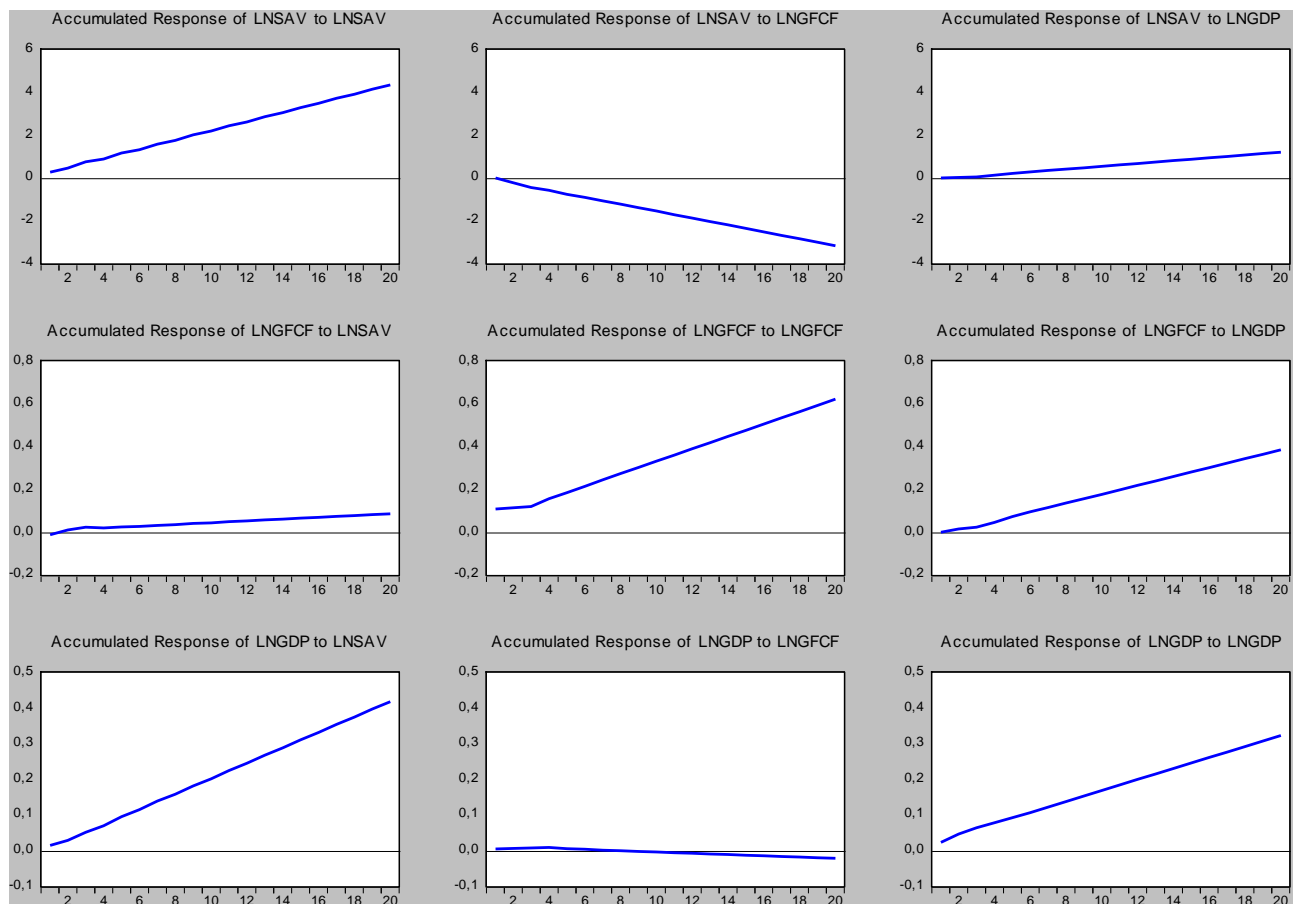
Figure 5.1: Impulse response functions for savings, investment and GDP

Source: Author's calculation from Eviews 8.

To sum up, a sudden increase in savings significantly affects savings, investment and economic growth in ways that are both theoretically and empirically correct. All the variables respond positively to a sudden increase in savings. On the other hand, a sudden increase in investment leads to responses that make both theoretical and empirical sense. It can also be argued that investment seems to have only short run and long run effects on itself and savings, but does not affect economic growth. As far as a sudden increase in economic growth is concerned, it significantly affects savings in the long run but not in the short run and significantly affects

investment and economic growth in both the short run and the long run. Regardless of the insignificance of the response of economic growth to investment and the response of savings to economic growth in the short run, the results are generally good.

5.7.   THE VARIANCE DECOMPOSITION FUNCTIONS

5.7.1. Variance decomposition of savings

In the analysis of variance decomposition, the study compares the short run with the long run decomposition of the variables. In this context, the period of one to five years is regarded as the short run and six to 20 years is regarded as the long run. According to Table 5.5, in the fifth year, 64 per cent of the variation in savings is explained by the shocks to savings and another 32 and three per cent is explained by investment and economic growth respectively. This implies that the greater part of the variation in savings is explained by shocks to savings in the short run followed by investment and then economic growth. This may be because of the close relationship that exists between savings and investment from a theoretical point of view. It was noted from theory that savings are not directly related to economic growth while investment is the one that is directly related to economic growth. In addition, in the long run the importance of savings shocks and investment shocks in explaining savings variation diminishes, while the importance of economic growth in explaining savings variation increases. Thus, after 20 years savings, investment and economic growth shocks explain 61, 33 and five per cent respectively of the variation in savings. In conclusion, it is noteworthy that the order of the importance of these shocks in explaining savings has not changed, since savings shocks still explain the greatest part of the variation in savings, followed by investment and then economic growth.

5.7.2. Variance decomposition of investment

Table 5.4 shows that in the short run, that is, after five years, 86 per cent of the variation in investment is explained by shocks to investment and the other nine per cent and five per cent are explained by shocks to economic growth and savings respectively. The study notes that economic growth is more important than savings in explaining the variations in investment in the short run. However, in the long run, 75 per cent of the variations in investment are explained by shocks to investment, while 22 per cent of the variation in investment is explained by economic growth and another three per cent by savings. It is to be noted that investment shocks become increasingly less important in explaining variations in investment in the long run. However, economic growth shocks become increasingly more important in explaining variations in investment, while savings become increasingly more important in the first five years, after which they become increasingly less important. This makes sense in that for the economy to be able to invest the prerequisite is that it should be saving and growing.

5.7.3. Variance decomposition of economic growth

Table 5.5 also indicates that the variations of economic growth are largely explained by shocks to economic growth in the short run (48%). The other 51 per cent of the variation in economic growth is explained by shocks to savings, and investment shocks explain a meagre one per cent of the variation in economic growth. The order of importance of the shocks in explaining variations in economic growth in the short run is savings, economic growth, and investment, respectively. In the long run, shocks to savings become increasingly more important in explaining variations in economic growth, while shocks to investment and economic growth become increasingly less important in explaining variations in economic growth. To illustrate, after 20 years, 62 per cent of the variation in economic growth is explained by shocks to savings, while one per cent and 37 per cent of the variation in economic growth is explained by investment and economic growth respectively. This helps to support the point that for the economy to grow it has to save first and it is from these savings that the economy gets the funds to invest and grow.

Table 5.5: Variance Decomposition Results

Variance Decomposition of LNSAV

Period	S.E.	LNSAV	LNGFCF	LNGDP
1	0.271476	100.0000	0.000000	0.000000
5	0.674895	64.03097	32.86233	3.106701
10	0.907616	62.30702	33.28738	4.405601
15	1.108066	62.06399	33.19188	4.744131
20	1.266423	61.55360	33.44822	4.998181

Variance Decomposition of LNGFCF

Period	S.E.	LNSAV	LNGFCF	LNGDP
1	0.109388	1.180714	98.81929	0.000000
5	0.128032	5.135551	85.59544	9.269005
10	0.151553	4.027804	79.88435	16.08784
15	0.171582	3.474586	76.57832	19.94709
20	0.189490	3.085554	74.52946	22.38499

Variance Decomposition of LNGDP

Period	S.E.	LNSAV	LNGFCF	LNGDP
1	0.028537	28.20851	3.103824	68.68767
5	0.061641	51.26950	1.101811	47.62869
10	0.085204	58.06833	0.847729	41.08394
15	0.104252	60.94766	0.732428	38.31992
20	0.119877	62.09979	0.660800	37.23941

Cholesky Ordering: LNSAV LNGFCF LNGDP

Source: Author's calculation from Eviews 8.

5.8. AN ANALYSIS OF THE VALIDITY OF THE RESULTS

The robustness of the VECM results is checked by analysing parameter stability using the CUSUM and the CUSM of Squares tests. These results are shown in Figures A1, A2 and A3 in Appendix A. These six figures indicate that the residual variance of each equation is stable since the test statistics remain within the 5% critical limits for both tests. Additionally, Table 5.8 indicates that the individual series are normally distributed and this is a critical property when using VAR and VECM. These test results indicate that the data applied is robust and that it is likely to give reliable results.

The Inverse roots of the characteristics AR polynomial used to determine stationarity or stability of the models are denoted in Table 5.7 for the saving, investment and economic growth model. All the inverse roots of the characteristic AR polynomials have moduli of one or less than one and lie inside the unit circle, implying that at the chosen lag length of order one the estimated models are stable or stationary. In the case of the VECM, problems arise if one of the moduli is greater than one. Lastly, serial correlation test results are summarised in Table 5.6 for the saving, investment and economic growth. There is no serious autocorrelation in the model. The results of the savings, investment and economic growth model are therefore valid and reliable.

Table 5.6: VEC Residual Serial Correlation LM Tests

Lags	LM-Stat	Probability
1	5.261791	0.8109
2	4.999661	0.8343
3	4.512247	0.8746

Probabilities from chi-square with 9 degrees of freedom.

Table 5.7: Roots of Characteristic Polynomial

Root	Modulus
1.000000	1.000000
-0.903290	0.903290
0.880840	0.880840
-0.253776 - 0.614266i	0.664624
-0.253776 + 0.614266i	0.664624
0.601834	0.601834
0.158084 - 0.494515i	0.519168
0.158084 + 0.494515i	0.519168
-0.093347	0.093347

VEC specification imposes 1 unit root(s).

Source: Author's calculation from Eviews 8.

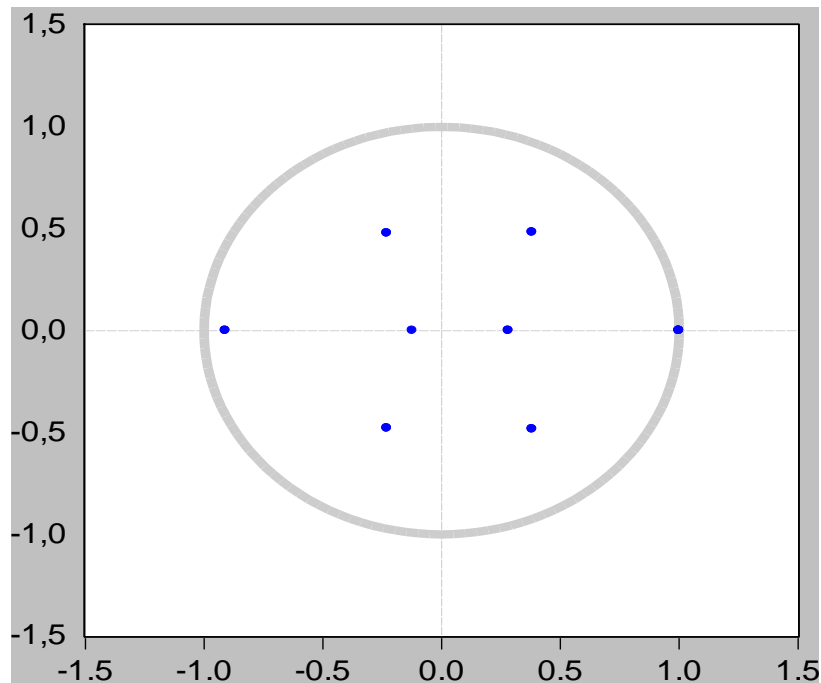**Figure 5.2: Roots of Characteristic Polynomial**

Source: Author's calculation from Eviews 8.

Table 5.8: VEC Residual Normality Tests

Component	Jarque-Bera	df	Prob.
1	1.566895	2	0.4568
2	0.801541	2	0.6698
3	0.109095	2	0.9469
Joint	2.477531	6	0.8710

5.9. CONCLUSION

The results indicate that the variables used in the study are all integrated of order one, meaning that the variables need to be differenced once to become stationary. The appropriate lag length to be used in the model is found to be one. The results show that investment Granger causes savings and also that investment and economic growth collectively Granger cause savings. The causality between savings and investment in unidirectional running from investment to savings. The study shows that shocks to savings affect savings and growth positively and significantly in both the short run and the long run. Additionally, the results show that shocks to savings affect investment in the long run and not in the short run. The results also reveal that shocks to investment significantly affect investment and savings in the short run, but they are insignificant in explaining economic growth. Additionally, shocks to economic growth significantly influence savings, investment and

economic growth in the long run. However, both savings and investment appear to be insignificantly influenced by shocks to economic growth in the short run. The variance decomposition results show that the variation in savings is largely explained by shocks to savings, investment and economic growth, in that respective order of size. The results established that the variation in investment is explained by shocks to all the three variables significantly, although it can be noted that investment and economic growth are more important in explaining investment in the long run. Lastly, the results clearly show that variations in economic growth are not explained by investment shocks in both the short and long runs. In addition, savings shocks are more important in explaining variations in economic growth than economic growth in both the short run and long run.

CHAPTER 6

CONCLUSION, POLICY IMPLICATIONS AND FUTURE RESEARCH

6.1. INTRODUCTION

The current concludes the study, gives policy suggestions based on the results obtained in previous chapters and highlight possible areas for further research. Section 6.2 gives a summary of the study findings. Section 6.3 highlights the major conclusions and policy recommendations emanating from the study. Moreover, Section 6.4 summaries the limitations of the study and suggests possible areas of future research.

6.2. SUMMARY OF THE FINDINGS

The results obtained from the study are summarised below:

- The results indicate that the variables used in the study are all integrated of order one, meaning that the variables need to be differenced once to become stationary.

- The appropriate lag length to be used in the vector autoregression model is one.

- The results show that there are two cointegrating equations using the Trace test and no cointegrating equations using the Maximum Eigenvalue test. Given this situation, the study assumed that there are two cointegrating equations since the Trace test is deemed more powerful than the Maximum Eigenvalue method.

- Investment Granger causes savings and also investment and economic growth collectively Granger cause savings. Additionally, the causality between savings and investment in unidirectional running from investment to savings.

- Shocks to savings affect all three the variables positively and significantly. In addition, shocks to investment significantly affect investment and savings in the short run, but they are insignificant in explaining economic growth. Additionally, shocks to economic growth significantly influence savings, investment and economic growth.

- The variation in savings is largely explained by shocks to savings, investment and economic growth, in that respective order of size.

- The variation in investment is explained by shocks to all the three variables significantly, although it can be noted that savings and economic growth are more important in explaining investment in the long run than investment.

- Variations in economic growth are not explained by investment shocks in both the short and long runs. In addition, savings shock is more important in explaining variations in economic growth than economic growth in the long run.

- The AR roots characteristic polynomial test, LM autocorrelation tests, and the Jarque Bera normality test all show that the model results obtained are reliable and robust.

6.3. CONCLUSIONS AND POLICY RECOMMENDATIONS

The study reached the following conclusions:

1. That investment Granger causes savings and also that investment and economic growth collectively Granger cause savings. This implies that policies that increase investment and economic growth lead to an increase in savings and not *vice versa*. Therefore, investment and economic growth have to be realised first before savings can be realised. On the policy front, policies that increase investment and economic growth will eventually lead to an increase in savings.

2. That shocks to savings affect savings, investment and economic growth positively and significantly in both the short run and the long run. In addition, shocks to savings affect investment in the long run and not in the short run. It can be concluded that all the three variables respond positively to a shock in savings and this makes economic sense.

3. That shocks to investment influence investment significantly and positively in both the short run and the long run. Further, a shock to investment leads to a fall in investment. This is economically plausible because when there is a sudden increase in investment this automatically means that there will be a sudden decrease in savings. Shocks to economic growth significantly influence savings, investment and economic growth in the long run; and in the short run it appears that savings and investment are not affected by shocks to economic growth.

4. That variance decomposition of savings is largely explained by shocks to savings, investment and economic growth in that respective order of size in both the short run and the long run.

5. That the variation in investment is significantly explained by shocks to investment and economic growth in the long run. However, shocks to economic growth are only significant in explaining variation in investment in the long run. Additionally, savings are insignificant in explaining the variation in investment in both the short run and the long run.

6.   That variations in economic growth are not explained by investment shocks in both the short and long runs and also that savings shocks are more important in explaining variations in economic growth than economic growth in both the short run and the long run.

Since to a large extent all the variables, that is, savings, investment and economic growth, are influencing each other in ways that are theoretically and empirically valid, it follows that if policies are put in place to encourage investment, they will eventually lead to the growth of the economy. It is to be noted that both monetary and fiscal policy could be used to influence savings in the economy through their effects on investment and economic growth. In the case of monetary policy, if measures are taken to increase the deposit rates offered by the banks and also to increase the rates of returns on the investment accounts, this will increase the national savings levels and eventually lead to economic growth. On the fiscal front, a reduction in income taxes and corporate taxes increases disposable income and corporate profits, which are also important in increasing savings in the economy, eventually leading to an increase in investment and economic growth.

6.4. LIMITATIONS AND AREAS OF FUTURE RESEARCH

One limitation associated with the current study is data related. Studies that apply the VECM methodology normally make use of quarterly time series data. Because this data is not readily available in Namibia, annual data was used. As quarterly data becomes available in future, it would be interesting to compare the results of the same study that uses quarterly data with the current results. Another limitation of the current study is that it could not compare different methodologies on the same data due to time limitations. It would therefore also be interesting to use a different methodology, for instance the Autoregressive Distributed Lag Model (ARDL) or the structural vector autoregression (SVAR), to compare the results with the results of the current study.

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APPENDIX A:

VARIABLE STATISTICS AND PARAMETER STABILITY TESTS

Table A.1: The Variable Statistics

| YEAR	GFCF	GFCFG	GDP	GDPG	SAV	SAVG	DEPR
1990	4821.3	20.8	36347.5	2.0	1473.9	21.9	12.9
1991	3729.5	-22.6	39315.5	8.2	790.4	-46.4	16.4
1992	5212.2	39.8	42142.1	7.2	1223.3	54.8	9.0
1993	5500.8	5.5	41476.4	-1.6	1317.4	7.7	8.6
1994	5873.5	6.8	42193.9	1.7	2315.4	75.8	-3.0
1995	6762.0	15.1	43839.0	3.9	2188.3	-5.5	11.2
1996	7935.8	17.4	45238.1	3.2	2528.2	15.5	3.7
1997	6880.2	-13.3	47147.2	4.2	1947.2	-23.0	12.4
1998	8554.8	24.3	48699.1	3.3	2774.8	42.5	11.4
1999	8913.9	4.2	50339.9	3.4	2900.3	4.5	11.0
2000	8111.0	-9.0	52097.8	3.5	3642.4	25.6	2.6
2001	10973.0	35.3	52711.5	1.2	4832.9	32.7	2.9
2002	10888.1	-0.8	55235.7	4.8	5828.8	20.6	2.8
2003	10344.5	-5.0	57577.6	4.2	3836.6	-34.2	13.6
2004	10988.1	6.2	64642.1	12.3	7170.0	86.9	9.3
2005	11383.0	3.6	66277.1	2.5	9156.0	27.7	4.8
2006	14773.8	29.8	70965.0	7.1	14139.4	54.4	1.7
2007	16568.0	12.1	74778.7	5.4	11719.0	-17.1	5.6
2008	18457.7	11.4	77654.5	3.8	11091.0	-5.4	2.5
2009	16985.2	-8.0	76521.7	-1.5	4863.0	-56.2	3.9
2010	18967.7	11.7	81568.9	6.6	9271.0	90.6	5.9
2011	25361.9	33.7	86472.6	6.0	9396.0	1.3	4.7
2012	22953.1	-9.5	92258.3	6.7	11018.0	17.3	-3.8
2013	27566.8	20.1	96322.8	4.4	8107.0	-26.4	-3.8
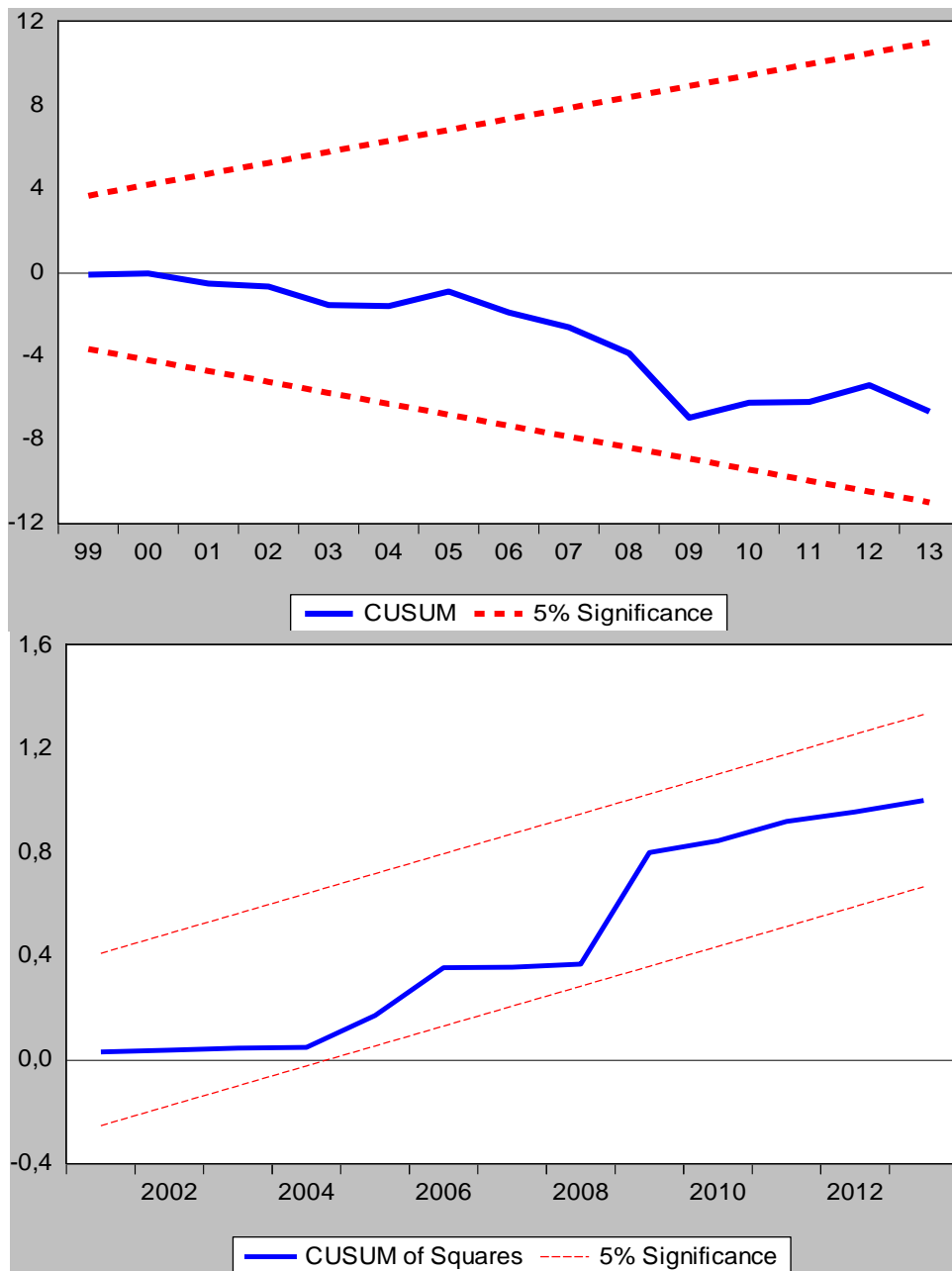
Figure A.1: CUSUM test for the Savings Equation

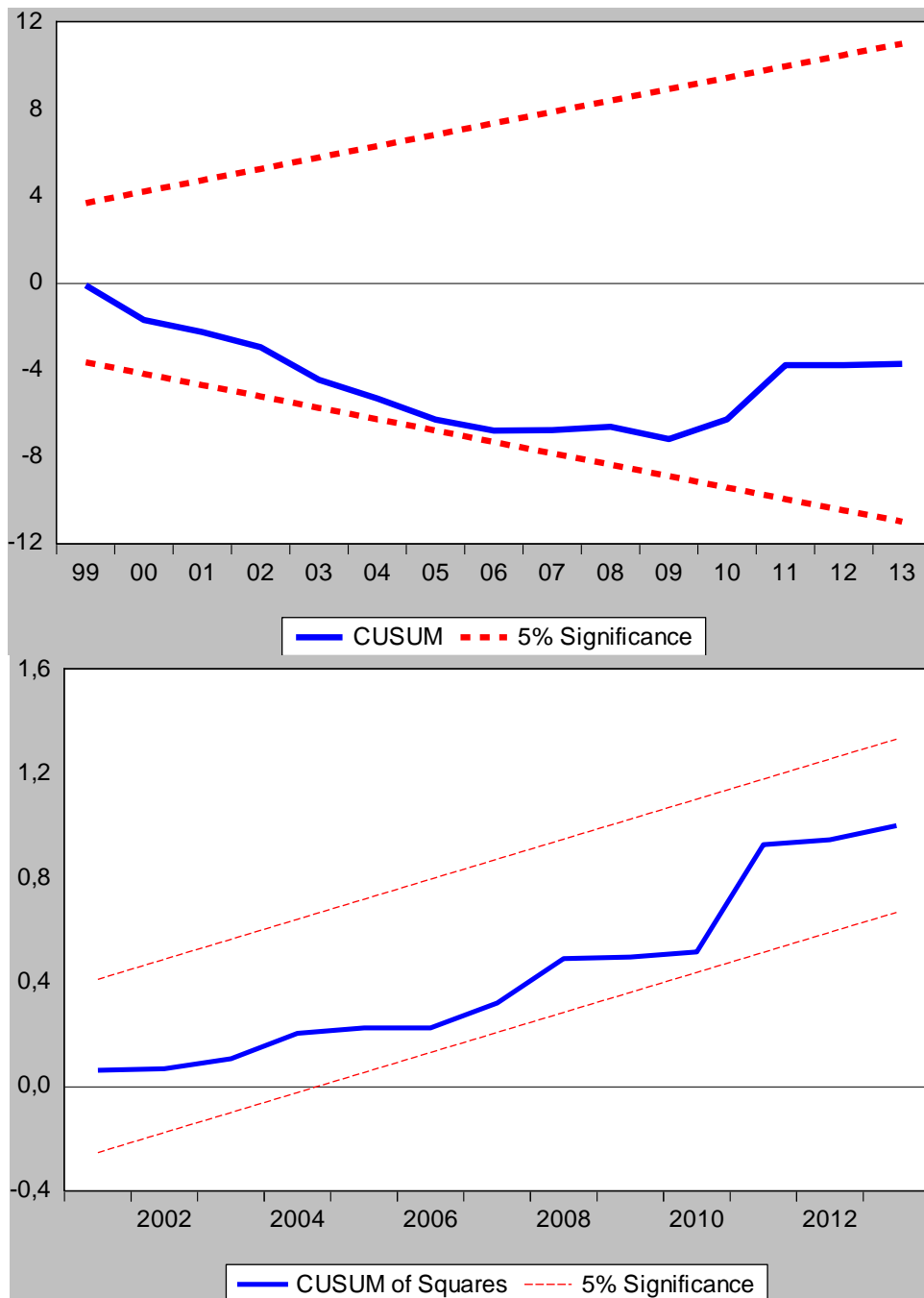Source: Author's calculation from Eviews 8.

Figure A.2: CUSUM test for the Investment Equation

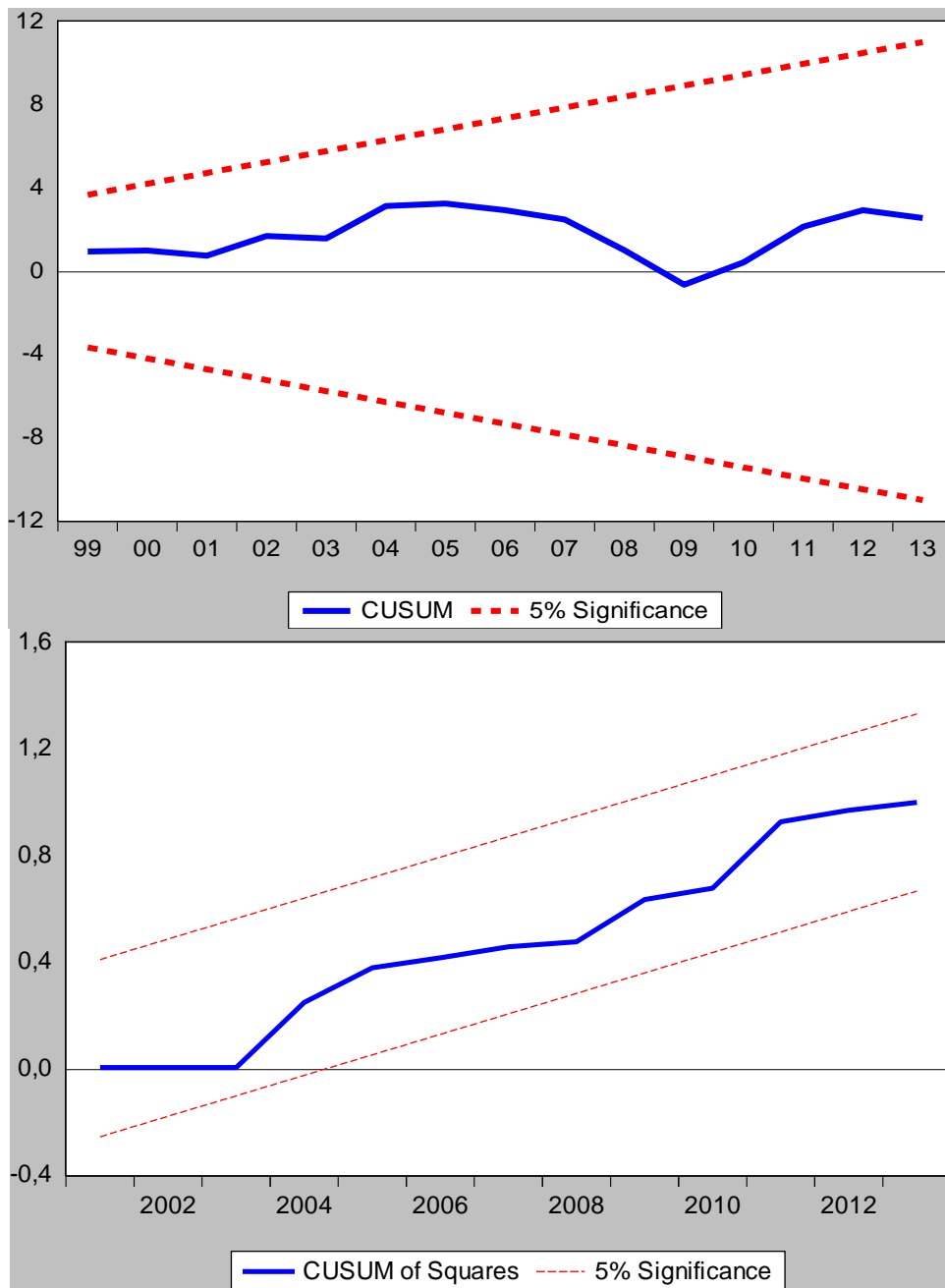Source: Author's calculation from Eviews 8.

Figure A.3: CUSUM test for the GDP Equation

Source: Author's calculation from Eviews 8.