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THE IMPACT OF SAVINGS AND INVESTMENT ON THE NAMIBIAN ECONOMY

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Acronyms

ADF	Augmented Dickey Fuller
AIC	Akaike Info Criterion
ARDL	Auto Regressive Distributed Lagged model
BBA	Basic Bank Account
BON	Bank of Namibia
EPZ	Export Processing Zone
FIA	Foreign Investment Act
FDI	Foreign Direct Investment
FLI	Financial Literacy Initiative
GDI	Gross Domestic Investment
GDP	Gross Domestic Product
GDS	Gross Domestic Savings
MPC	Marginal Propensity to Consume
MPS	Marginal Propensity to Save
NAMFISA	Namibia Financial Institutions Supervisory Authority
NSA	Namibia Statistics Agency
OLS	Ordinary Least Squares
SACU	Southern African Customs Union
SADC	Southern Africa Development Community
USA	United States of America
VAT	Value Added Tax
VECM	Vector Error Correction Model
VAR	Vector Auto Regression

EXECUTIVE SUMMARY

This was a desk research study which sought to investigate the impact of savings and investment on the Namibia economy for the period 1981 – 2018. Furthermore, the study examines relationships among Consumption, Gross Domestic Savings (GDS), Gross Domestic Investment (GDI) and Gross Domestic Product (GDP). For the methodology, the study employed Auto-Regressive Distributed Lag (ARDL) econometric approach while making use of available secondary annual time series.

The study makes the following analysis and findings:

- **During the period of review, Consumption (as % of GDP) was higher than Gross Domestic Investment (GDI) and Gross Domestic Savings (GDS).** To this end, consumption, GDI and GDS (all as % of GDP) averaged 88.6, 17.2 and 11.4%, respectively. This pattern of consumption (as % of GDP) being the largest of the three variables is characteristic of a typical economic structure of developing economies where households consume more than they can save or invest. This development also implies that not much of the resources were directed towards growing the economy through savings and investment as evidenced by the resulting average GDP growth of 3.2% during the same period.

- **The period 2015 to 2018 was characterized by high capital outflow which negatively affected savings.** Thus, this situation contributed to indebtedness and eventually constrained expenditure which led to slow economic growth and low per capita income thereby affecting people's standards of living.

- **Consumption was found to have a positive and significant impact on GDP in Namibia.** Thus, there is a need to continue supporting domestic consumption together with other variables to achieve economic growth in both short and long run in Namibia. Furthermore, Export relative to import ratio is found to be positive and significant in Namibia. Thus, an increase in exported goods and services relative to imported goods and services has positive impact on GDP growth rate in Namibia. Therefore, there is a need to encourage local goods manufacturing and local consumption to reduce imports of goods and services because such

will bring about improved living standard as well as the much-needed foreign currency in the economy.

- **During the review period, Namibia had the second highest dependency ratio (*the proportion of the economically inactive population to the economically active population in an economy, usually, 0-14 years and senior citizens older than 60 years)* among selected SADC countries.** Herein, the dependency ratios within selected SADC countries were highest in Eswatini (88.8%) and Namibia (84.3%) while lowest in Mauritius (43.2%). In line with the life-cycle income hypothesis, a high population growth, all things being equal, has a negative impact on aggregate saving as it increases the dependency ratio. Thus, the dependency ratios above show much pressure each economy faces in supporting its non-productive population, and this has a negative impact on saving per household in an economy.

- **Among the selected SADC countries, Namibia had the second lowest GDS (as % of GDP), on average, during the period of review.** This was notwithstanding the fact that Namibia had the highest savings (% of GDP) among the selected SADC peers in 1980 at 37.8% followed by Botswana at 26.7% the same year. This indicates that Namibians generally consume more of their disposable income than they save compared to selected peer countries.

- **Moreover, Namibia's investment (as % of GDP) was one of the lowest amongst the selected SADC peers.** Botswana had the highest investment rate, followed by Mauritius, while Eswatini recorded the lowest. Although most of the countries' rate of investment (% of GDP) have shown a steady recovery after 2015, for Namibia's investment as a percentage of GDP fell significantly against the backdrop of among others, the end of construction boom experienced in the mining sector and fiscal consolidation measure which somewhat led to a reduction on capital investment.

- **Through the econometric tests, the study concludes that investment, consumption and savings all positively impact real GDP growth in the long run.** To this end, the study establishes that a percent increase in investment and consumption will result in 0.19 and 0.84% GDP growth in the long run, respectively. Also, a percentage increase in either import export

ratio or gross domestic savings will lead to 0.27 and 0.07% increase in GDP growth rate in the long run, respectively.

Section 1: Introduction and overview

1.1.Introduction

According to the national account system, Gross Domestic Product (GDP) for a given economy is given by the summation of consumption, investment or Gross Domestic Investment (GDI), government expenditure and net exports (exports minus imports). GDP is in the simplest terms the value of final goods and services produced in an economy in a period of time (usually a year or quarter). Gross Domestic Saving (GDS) represents the part of disposable income that is not spent on final consumption of goods and services.

Globally, scholars have econometrically established the impact of investment to an economy in terms of driving economic growth, contribution to GDP etc. Notwithstanding this however, limited studies have included saving or Gross Domestic Saving (GDS) as well given its importance in the investment-growth nexus. Therefore, there appears to be a dearth in literature on the impact of both investment and saving to the Namibian economy. Against this backdrop, this paper sought to estimate the impact of saving and investment for the Namibian economy to enrich the noted literature gap and to also provide basis for evidence-based decision-making and consequently inform macroeconomic policy formulation.

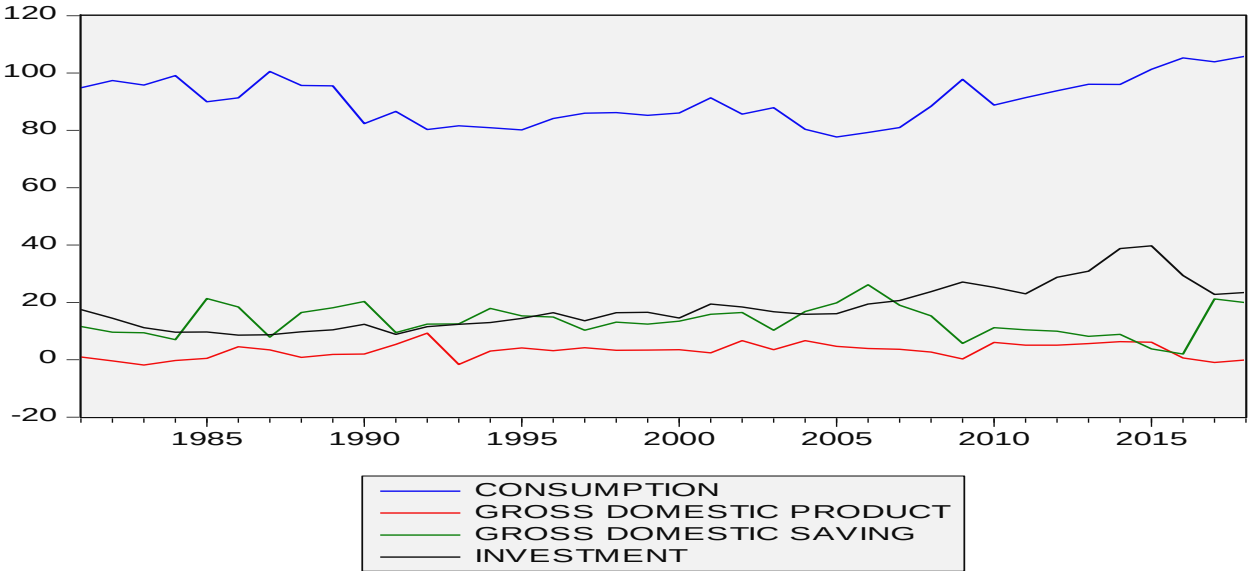
The growth rate of savings in Namibia has been relatively high between 1981 and 2014; however, it was coupled with high capital outflow whereby that did not translate into higher investment in the country. This trend has been reversed such that in 2015 and 2017 savings have turned to a negative territory having recorded 3.5% and 5.3%, respectively. It is noteworthy to mention that negative savings does not mean that there were no savings at all, but simply means that the economy was spending more than it could save during the said period. According to Steindler (2007), negative savings would seem to point to growing indebtedness which constrain expenditure, impede growth and ultimately serves to indicate a decline in the living standards of the people. This sentiment might be applicable to the Namibian situation as its debt to GDP rose close to 50% during 2015/16 – 2018/19.

From the economic perspective, investment increases the capital stock of economies, such as equipment, machineries, factory construction, and many others. Maintaining a high rate of investment is one of the factors responsible for good economic performance (Abubakari, et al., 2018). Abubakari et al furthermore states that capital increases by investment and more investment

necessitates more savings in the economy, which in turn serves as the source of investment and subsequently economic growth. On the other hand, investment from financial assets provides a stream of future income to the owners. Muhammad et al (2013) confirms that investment expenditure is made not only for present wealth creation but for future wealth creation, a view well-agreed to by both economic and financial researchers.

Investment is a function of savings meaning an increase in investment stems from an increase in domestic savings of an economy making it a significant indicator of future economic growth. Thus, savings is crucial in providing the national capacity for investment and production which in turn has an impact on economic growth. A serious constraint to economic growth can be caused by low savings (Hishongwa, 2015). Given the fact that investments are a function of savings they move in the same direction meaning that if savings decreases, investment will also respond in the same manner. However, in Namibia a different picture is portrayed as the trend shows a divergence from 2007 where domestic savings and investment are moving in opposite directions, as savings is decreasing while investment is increasing. *Figure 1* shows consumption, gross domestic saving, investment and gross domestic product in Namibia for the period 1981 to 2018.

Figure 1: Consumption, GDS, Investment (as % of GDP) and GDP growth rate



Data source: National Statistics Agency, 2017 and author's calculations

From 2007-2009 onward, savings started declining attributable to global financial crisis resulting to de-saving in the economy. On the other hand, investment took an upward trajectory showing improvements from 2007 - 2015 attributable to Targeted Intervention Programme for Employment

and Economic Growth as well as capital investment growth in the mining sector[1]. Consumption remained all high from 1981 to 2018. Furthermore, consumption has shown to have a negative relationship with savings as when consumption increases (decreases), savings decreases (increases). This ties well with Keynes and his advocates who advanced that "saving is a function of disposable income thus the more income earned; the more is available for saving (saving representing unspent income). Jagadeesh (2015) states that savings has always been seen as the engine of economic growth, that in due course contributes to breaking the vicious circles of poverty in developing countries. Thus, savings is one of the important components in economic growth and impacts investment greatly.

1.2.Justification of the study

In order to finance the investment needed to achieve higher economic growth, the economy needs either to generate savings or increase its external borrowing. Given Namibia's debt borrowing which is close to 50% of GDP, external borrowing would be an extremely expensive option, therefore generating domestic savings remains one of the cheapest options as a source of funds for the economic development (Budget statement, 2018/19).

According to Uanguta, et al. (2004) and Eita (2013), Namibia has experienced a high outflow of funds (domestic savings) for better yields elsewhere since independence whereby it has not been able to absorb all savings generated in the economy as it has invested mainly in South Africa, making it a national concern to policy makers. A country's economic progress depends largely on the ability of a nation to mobilize the necessary savings to finance capital formation in order to increase the rate of economic growth and development (Arok, 2014). In order to fully understand the impact especially in Namibia, it is therefore crucial to study the impact of gross domestic savings and investment on the economy, thereby recommending how they can both promote economic growth and development. In trying to explain the impacts of saving and investment on economic growth, it is best to note that increases in saving results to increase in capital formation and eventually to investment thereby raising economic growth. The study seeks to empirically uncover whether saving and investment has an impact on Namibia's economic growth.

[1] B2G, Husab, Ohorongo and Tschudi mines

1.3.Objectives

The main objective of this study is to analyse and determine the impact of Gross Domestic Saving (GDS) and Gross Domestic Investment (GDI) on economic growth in Namibia for the period 1981-2018. Furthermore, the study examines relationships among Consumption, GDS, GDI and GDP. This study tries to bridge the literature gap and provides substantive enrichment to the current body of knowledge on the impact of consumption, savings and investment on economic growth in Namibia. Additional variables such as repo rate and import are employed as control variables in the model.

1.4. Legislative and regulatory framework

Growing the economy is a daunting task, hence needs legislative arm of the law to regulate and direct the course of development. Below are some of the legislations and regulatory frameworks that guide savings and investment in Namibia. There are two types of saving institutions within the Namibian Financial System namely; the *banking* and *nonbanking financial institutions*. The banking institutions consist of commercial banks, while the non-banking institutions consist of insurances companies (long and short term), unit trusts, pension funds, stock exchange, medical aid funds, building societies and asset management companies.

The Bank of Namibia (BoN) is tasked with overseeing and regulating the banking sector in accordance with the Bank of Namibia Act 1990 (Act no.8 of 1990). BoN is the government's bank and lender of last resort to commercial banks. Commercial Banks are governed by BoN under the banking institution Act 1998 (Act no. 2 of 1998). Savings with commercial banks are voluntary and are highly flexible as the funds are available if not immediately then within a short period of time. The consumer uses the commercial banks as a saving mechanism by means of deposits, and there are several products offered by the commercial banks to consumers for the purpose of saving, as such; *fixed deposits* accounts, which is an account where money is deposited for a fixed period of time and interest does not fluctuate over time; *call account*, is an account that earns you good interest – without sacrificing immediate access to your money; *notice deposit account*, consist of varying notice period and is an account that earns you interest towards the costs of short term goals; *Savings account* is a simple and easy way to start saving and where you have access to your funds when you need it. The interest rates earned on these accounts depends on the type of account and the investment period as well as the amount invested.

Namibia Financial Institutions Supervisory Authority (NAMFISA) has the regulatory power over nonbanking financial institutions in Namibia in accordance with the NAMFISA Act 2001 (Act no 3 of 2001). Savings and investment with nonbanking financial institutions are mainly contractual and serve longer periods; the availability of funds is rather rigid because the usages of funds are incident bound. The non-banking financial institutions are governed by NAMFISA under the different legislations and policies such as below:

The ***short-term insurance*** companies are governed by the short-term insurance Act 1998 (Act no. 4 of 1998). The short-term insurance is meant to insure personal movable and immovable assets against fire, explosion, and acts of nature, theft, subsidence, owner's liability that might occur and affect the said asset in the short term.

The ***long-term insurance*** companies are governed by the long-term insurance Act 1998 (Act no. 5 of 1998). The long-term insurance includes education cover plan, life cover, and retirement annuity.

The ***medical aid funds*** are governed by the Medical Aid Fund Act 1995 (Act no. 23 of 1995) for providing financial or other assistance to members of the fund and their dependents in defraying expenditure incurred by them in connection with the rendering of any medical service.

The pension funds are governed by the Pension Fund Act 1954 (Act no. 24 of 1954) for providing annuities or lump sum payments for members or former members of such association upon their reaching retirement dates, or for the dependents of such members or former members upon the death of such members or former members. The Pension funds are encouraged to invest in the domestic market to ensure that Namibia savings are utilized to stimulate the development. In view of this consideration, Regulation 28 of the Pension funds acts requires pension funds to hold a minimum of 35% of their investment in Namibian assets with maximum of 3.5% in unlisted investments.

The ***unit trusts*** are governed by the Unit Trust Act 1981 (Act no. 54 of 1981), which is a "scheme or arrangement, in whatever form, including an open-ended investment company, in pursuance of which members of the public are invited to acquire an interest or undivided share in one or more unit portfolios and to participate proportionately in the income or profits derived therefrom, whether the value of such interest, unit or undivided share which may be acquired remains constant or varies from time to time".

1.4.1. Currency and Exchanges (Act No. 9 of 1933) and the Exchange Control Regulations 1966

Exchange Control within the Common Monetary Area is being regulated by the Currency and Exchanges Act No. 9 of 1933 and the Exchange Control Regulations 1961, issued there under Different exchange control rulings apply to the transactions of residents of the Common Monetary Area ("CMA"), and other non-residents. The CMA is comprised of the Republic of South Africa, Lesotho, Namibia and Swaziland. There are no trade and exchange restrictions between the members of the CMA, and the members form a single exchange control territory. Lesotho, Namibia and Swaziland have their own exchange control authorities as well as their own acts, regulations or laws. However, in terms of the CMA Agreement, the application of these authorities and rules must be at least as strict as that of South Africa. Accordingly, investments and transfers of funds from South Africa to other CMA countries do not require the approval of Exchange Control but may require the approval of the host country.

1.4.2. Stock Exchanges Control Act 1985 (Act no. 1 of 1985)

The ***stock exchange*** is governed by the Stock Exchanges Control Act 1985 (Act no. 1 of 1985), a premises which is recognized by the committee of that stock exchange to be the place where dealings in listed securities may take place; and a number of persons who either on their own account or on behalf of their employers, congregate at intervals, regular or other, for the purpose of buying and selling securities on behalf of other persons or on their own account.

1.4.3. Namibia Investment Promotion Act 2016 (Act no. 9 of 2016)

Namibia Investment Promotion Act of 2016 which is yet to be enforced amends the Foreign Investment Act 1990 (Act no. 27 of 1990). The initial (act no. 27 of 1990) brought about the Namibia Investment Centre (NIC) within the Ministry of Industrialization and Trade. The NIC facilitates the promotion and administration of foreign investments, therefore, makes it the first point of contact to obtain up-to date information on investment in the country, as well as any assistance with investment incentives, introduction and administration requirements, to mention but a few. The main reasons for amending the Foreign Investment Act of 1990 was due to the foreign direct investment and domestic investments which were dwindling as a result of some stringent clauses in the earlier act (FIA of 1990).

1.4.4. The Export Processing Zone (EPZ) Act (Act no. 9 of 1995)

The Export Processing Zone (EPZ) was launched in 1996 through the enactment of the EPZ Act (Act no. 9 of 1995). EPZ companies do not pay corporate tax, VAT tax, stamp duty and transfer duty.

Namibia has a highly competitive incentive and sound fiscal regime that has contributed to its attractiveness to foreign investments. The country is giving the lowest credit risk ratings in Africa compared with peer countries. Since independence, Namibian government has been striving to increase levels of foreign investment as another strategy of growing the economy through a range of specific initiatives. The Foreign Investment Act empowers and places foreign business interests on an equal footing with domestic businesses, and incentives for businesses that manufactures domestically, and exporting to the outside world and fetch foreign currency. The eligibility for EPZ status is that enterprises must engage mainly in manufacturing for export outside Southern African Customs Union (SACU). Sale of up to 30% of production on the local market may be allowed upon request. Other re-export operations allowed include repackaging. Local incorporation is not necessary, and foreign incorporation is acceptable, but EPZ status must be acquired before start of operation. Applications must be submitted to the EPZ Committee chaired by the Minister of Industrialization, Trade and SME Development, (Namibia Investment Centre, 2018).

1.5.Current efforts to promote domestic saving and investment

Economic growth is a concerted effort involving different developmental tools, stakeholders and institutional arrangements; hence, the notion of sustainable development presents a challenge for policy makers and this goes beyond the traditional concerns for economic growth (Kakujaha-Matundu, 2019). To encourage more saving and investment, the Namibian government together with the private sector is playing a major role in putting up infrastructures that will contribute to realization of the envisaged economic growth. Here below are some of the initiatives by the government and financial entities to entice individuals, small and medium enterprises to open accounts and start saving and investment.

1.5.1. Basic Bank Account

The Bank of Namibia in conjunction with the commercial banks introduced a Basic Bank Account (BBA). Such an account creates conducive banking environment for inclusivity purpose so that all Namibian citizens may have access to banking services regardless of their income levels. This initiative is believed to encourage a saving culture, while ensuring security simultaneously. The operations standard for the basic bank account is uniform among the commercial banks although each bank has a different name for this same product. The BBA is intended for Namibian citizens and those with permanent residents earning an income of N$2,000 and less per month. Such an account can be opened with a minimum amount of N$20 and such an account can be dormant for one year before it is closed. Balance enquiry service is available free of charge at own Automated Teller Machines (ATM). Furthermore, such account can be accessed electronically, and the debit cards can be used at the point of sale.

1.5.2. Financial Literacy Initiative

The Financial Literacy Initiative (FLI) is a national platform formed in 2009 by a group of public, private and civil society institutions in the financial services working together with the Ministry of Finance (MoF). The partners work on a voluntary basis to guide, coordinate as well as sharing experience in the implementation of the financial literacy initiative and related activities in Namibia. The initiative's vision "is an improved quality of life and a narrowed economic divide achieved through financially capable, assertive and well protected Namibians".

The FLI Goals:

- Increased knowledge and skills on financial services, products and institutions.
- Increased awareness of consumer rights and responsibilities.
- More financial institutions practicing responsible finance management.
- Enhanced protection of consumers through appropriate laws and regulation and availability of recourse mechanisms.

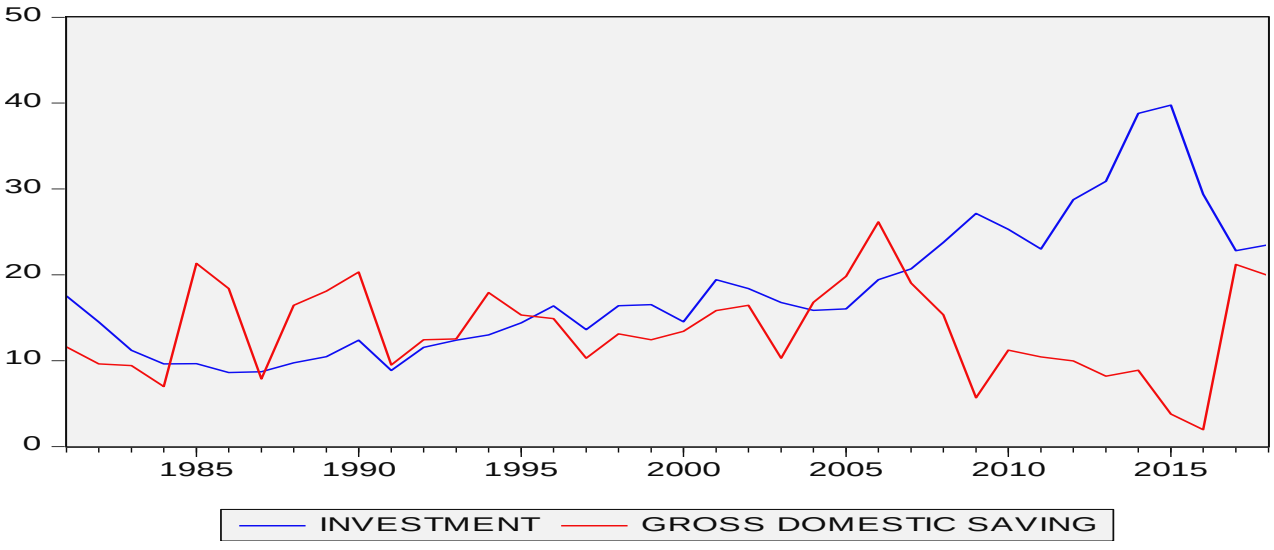
The target groups for the FLI are young people (Youth) including pupils/ students, employed people (especially low-income groups) and staff of financial service providers (banks, non-bank financial institutions, financial NGOs and microfinance institutions). Once the FLI has achieved its goals, more informed and well protected utilization of financial products and services are

accessed through promotions and awareness. The FLI had several media mix of street theatre, trainings, workplace activities and public events, as well as printed material shared in public domains. The campaign aimed at increasing the awareness on saving, budgeting, and spending behaviors.

1.6. Share of savings and investment to Gross Domestic Product (GDP)

Namibia has always been a saving exporting nation of which most are contractual savings from insurance and pension funds, and this has transpired through financial outflows as recorded in the balance of payments by Bank of Namibia, (Nghifenwa, 2009). A large portion of the domestic savings is accumulated by pension funds, insurance companies and other asset management companies, which is then exported for investment out of the country for higher returns on investment as Namibia lacks sufficient and profitable investment instruments (Zamuee, 2015; Uanguta, et al, 2014). The high investment in the country might have emanated from investment in the mining sector which comes from Foreign Direct Investment (FDI). Figure 2 shows saving and investment as percentage of GDP for the period 1981 to 2018 from which it is evident that although the two were somehow moving together during pre-2007 period, however, they have been diverging especially between 2007 and 2017.

Figure 2: Savings and investment (as % of GDP) from 1981-2018



Source: Investment (World Bank) and GDS (NSA)

For investment, the study used capital investment as a percentage of GDP. Investment in Namibia has been growing at a snail pace between 1981-1990 averaging 11.2%, and this slow growth in investment in the early 1980s could be attributed to the political conditions which prevailed as

there was eminent change in government regime. During the first post-independence decade, from 1991-2000, the average investment growth realised a marginal increase of 13.8% whereby not much change was anticipated immediately after independence in 1990, due to many aspects which needed to be changed into the new government perspective. Over the course of the second post-independence decade, from 2001-2010, investment growth averaged 20.3% and thereafter the average grew by 29.6% between 2011 and 2018. However, between 2005 and 2015, investment in Namibia depicted an increasing growth rate trend with a peak of 39.8% in 2015; and thereafter declined to 22.8% in 2017 attributable to the sluggishness in economic activities induced by drought, fiscal consolidation, and other external factors i.e. the exchange rate volatility, USA interest rates, as well as the political uncertainty in South Africa.

Savings in Namibia, on the other hand, has been oscillating between 2.0% and 26.2% during the period under review, with neither consecutive upward no downward trend observed, except for the global financial crisis which was caused by the collapse of the USA mortgage industry in 2009 recording 5.7% of GDP, after falling three consecutively from 26.2% in 2006, 19.0% in 2007, and 15.3% in 2008 respectively. However, 2016 recorded the lowest percentage of savings to GDP at 2.0% which can be attributed to the 0.3% contraction in economic performance, coupled with the rising debt to GDP ratio which has surpassed the 35% limit threshold.

One of the reasons for lower savings could be that households do not have surplus from their income, hence consume most of it. As per the data provided, savings contracted indicating that households had depleted their savings, thus opted to borrow in order to fund consumption expenditure, as alluded to in the Namibia Financial Stability Report, (Bank of Namibia, 2019). According to the same report the Credit to Disposable Income (CDI) was 77.2% on average from 2014 to 2018, with the highest credit to disposable income recorded at 78.4% in 2015. Going forward, savings is still expected to continue being low because more households are in much debts resulting in their income being spent on re-payment of the debts. The other factor that could have caused the low levels of savings during the period under review is the government measures to freeze vacancies in the public sector as well as the cancelation of some capital projects owing fiscal Consolidation which also contributed to a high number of workers being laid-off especially in the construction industry between 2015 and 2016. Due to job losses, households tend to use up their savings for current consumption, while those who still have jobs might struggle to pay back bank loans due to reduced disposable income.

Section 2: Review of Literature

2.1 Theorical foundation on consumption, savings and investments

In a Keynesian sense, savings is whatever is left over after income is spent on consumption of goods and services, whereas investment is what is spent on goods and services that are not consumed but are for long-lasting duration (Bhagat, 2019). The level of saving in the economy depends on several factors which are not limited to the ones below:

- A higher real interest rate will give a greater return on saving as banks offer more favorable rates.
- Poor returns on risky forms of saving, e.g. stocks and bonds, make it more advantageous to hold money savings (in contention between Keynesian and Monetarist views here, mostly because of differences in definitions).
- Poor expectations for future economic growth, increase households' savings as a precautionary measure for a grim future.
- More disposable income after fixed expenditures (such as mortgage, heating bill, basic goods purchases) have been made (in contention between Keynesian and Monetarist views here, mostly because of differences in definitions).
- Perceived likelihood of plunder of the future value of savings, via legal or extra-legal means, will make saving less attractive (in contention between Keynesian and Monetarist views here, mostly because of differences in definitions).

The above factors and many others will affect the Marginal Propensity to Save (MPS), thus the greater this MPS, the more saving households will do as a proportion of each additional increment of income (Bhagat, 2019).

Investment, on the other hand, is made into capital (i.e. plant and machinery, also human capital training and education) with intent to increase productivity, efficiency and output of goods and services. To understand the difference between savings and investments, below are few facts:

- In national accounting terms, stocks, bonds, mutual funds, and other items whose value is risky, are NOT investments. They fall into the savings account, not the investment account.
- In monetary terms, the relationship between savings and investment is modeled, rather than being an accounting identity. Stocks and bonds are considered to be important intermediary

forms of savings as it gets transformed into a capital investment that produces value. Mutual funds, Certificates of Deposits (CDs), Banks Investment Contracts (BIC)s, Guaranteed Investment Certificates (GICs), pension obligations, insurance annuities, and other forms of savings marketed by financial intermediaries, all consist of stocks, bonds, and cash balances, which in turn pay for the capital that increases productivity, efficiency and output of goods and services.

Having explained the difference between savings and investment, the study presents economic theories about saving and investment as follows:

2.1.1. Keynesian theory on saving and investment

The Keynesian theory on saving and investment assumes that investment causes saving through changes in income and that investment is not a function of real interest rates. Moreover, it states that investment is equal to saving at a range of potential levels of output and income but the optimal point is when there is full employment (Nwanne, 2014).

2.1.2. The Solow growth model

The Solow growth model assumes saving and investment to be functions of disposable income; that growth is dependent on the saving rate through investment, (Alogoskoufis, 2012); the rate of saving is exogenously determined and that an increase in the saving rate causes a reduction in real interest rates which has an increasing (positive) effect on investment and growth rate.

2.1.3. The Endogenous growth-model

The Endogenous growth model states that growth is determined by internal systems and that a higher saving rate leads to an increase in accumulated funds available, which has a positive impact on investment and therefore growth in the long run (Nwanne, 2014). It is said that the accumulated funds are channeled to investment through robust financial systems, (Zamuee, 2015). Both the Solow and the endogenous growth models are based on the neoclassical economic theory.

2.1.4. The Life-Cycle Theory of Consumption and Saving

The life-cycle hypothesis/theory assumes that an individual's consumption behavior in any given period is related to their income within the same time period. According to the life-cycle hypothesis, individuals plan their consumption and savings behavior over long periods with the intention of allocating their consumption in the best possible way over their entire lifelines. The life-cycle theory can be better explained by the relation below:

$$C = c_0 + c_1 Y_d \qquad 0 < c_1 < 1 \tag{1}$$

Where C=Consumption, c_0=Autonomous Consumption or intercept of the consumption function, c_1=marginal propensity to consume (MPC), Y_d= disposable income.

Autonomous consumption is in the simplest terms defined as the expenditures that consumers must make even in the absence of disposable income. Notwithstanding absence of income, expenses such as food, shelter, utilities, and health care can never be eliminated and consequently are deemed autonomous or independent. From equation 1 above, the MPC which lies between 0 and 1, is the increase in consumption per unit increase in income. The closer is the MPC to 1 (0), the less (more) income will be left to cater for saving and other needs. Accordingly, the higher the MPC, the lower will be the income saved or used to meet other needs. Disposable income simply refers to income remaining available to be spent or saved as one wishes after deduction of taxes and social security charges.

2.1.5. Permanent Income Hypothesis

Similar to Life-Cycle theory, Permanent-Income Hypothesis (PIH) postulates that consumption is related to a longer-term estimate of income ("permanent income") rather than to current income. In other words, PIH states that the consumption of the individual (or household) depends on his (or its) permanent income. Permanent income can be thought of as the income the individual expects to derive from his work and his holdings of wealth during his lifetime (Pearce, 1992). Accordingly, PIT contends that consumption is proportional to permanent income according to the relation below:

$$C = cYP \tag{2}$$

where C=Consumption, c=marginal propensity to consume (MPC), YP=permanent disposable income.

2.1 Empirical evidences on saving and investment

Different scholars have elucidated the relationship between saving and investment and other macroeconomic variables. Table 2 summarizes key findings on the relationship among the selected economic variables i.e. consumption, interest rate, foreign direct investment, labour, human capital, savings, investment and economic growth. Different combinations yielded almost the same results by researchers quoted in the literature review of this paper, indicating unidirectional between savings and economic growth (economic growth granger causal savings).

Although the researchers did not find several empirical studies on Namibia that analyzed the impact of saving and investment on the economy as this paper tries, however, there were several related studies that either looked at the determinants of savings; determinants of investment, determinants of economic growth, etc.

According to empirical evidence, there is a negative relationship between investment and interest rates, and a positive relationship between investment and saving but no relationship between saving and interest rate in Namibia that has been reported. However, there should be a positive relationship between saving and interest rates according to the classical and neoclassical schools of thought in existing literature, such that higher interest rates provide incentive to promote saving to finance investment as such accelerate growth in the long run.

In view of the Namibian economy, three studies investigated the impact and relationship of saving and investment. Nghifenwa (2009) adopted Ordinary Least Square (OLS) methods, co-integration and the error-correction model using annual data from 1970 to 2006 to study the determinants of investment in Namibia. The study established the following findings: (i) that accumulated domestic saving can be used for investment or can promote investment and contribute positively to economic growth; (ii) that saving indeed served as a source of funds for investment and has had a positive impact both on the short and long run on investment in Namibia; and (iii) that GDP and post-independence (post-1990) 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 government on investment promoting incentives especially in the technology and entrepreneurial sector.

Eita (2013) analyzed the determinants of investment in Namibia for the period 1971-2010. The study used the neo-classical model and analyzed the data using co-integration, Engle-Granger two step estimation techniques. However, the conclusions of this study were slightly deviating from the study by Nghifenwa (2009), in that saving was found to have a positive impact on investment but are not a sufficient condition for investment in Namibia. Eita also found a positive relationship between investment, GDP, 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) which is consistent with the existing literature. The deviation in findings of these studies by Eita (2013) and Nghifenwa (2009) can be attributed to the different variables studied by both researchers with only investment and saving as being the only identical variables. Although both studies used data for the same variables, the tools for data analysis and methodologies were also different, hence might have contributed to deviated results.

Ogbokor and Musilika (2014) used the Vector Autoregressive (VAR), Error Correction Model (ECM) as well as Causality Analysis and found some applicability to the Namibian economy. The Ogbokor and Musilika study concludes with a unidirectional causal relationship between saving and investment, thus running from saving to investment. Therefore, the study recommends for policy measures that encourage local saving by lowering the tax regime such that disposable income is boosted, hence more saving to realize the envisaged investment.

Eita (2013) used VAR and ECM and had mixed results which demonstrated that saving has an expected positive coefficient; however, it is statistically insignificant implying that saving is necessary but sufficient to accelerate investment in Namibia. Some of the differences in findings were due to difference in methodologies and variables adopted in similar studies. However, the Ogbokor and Musilika study this was not the case with Eita's findings of excess saving which resulted in outflow of capital but with less effect on investment hence concludes that saving is necessary in Namibia although the coefficient was insignificant to positively impact investment. Therefore, suggests other factors to compliment saving in order to realize investment and economic growth in the country.

Studies from other African countries and the rest of the world cited are as follows: Jagadeesh (2015) undertook an investigation of saving impact on economic growth in Botswana and found a positive strong correlation between gross domestic savings and GDP. The research paper also concludes that saving was 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 saving on Gross Domestic Product and used the test of stationarity, co-integration and the Auto Regressive Distributed Lagged model (ARDL) to analyze 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 was the promotion of locally manufactured goods to boost exports, as well as to increase the country's foreign reserves.

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

Another perspective where consumption can be negatively affecting GDP growth is when government size is way too big and thus blot the expenditure way too high, of which such spending is mostly unproductive expenditures. According to Sheehey (1993), the net impact of government on growth may initially be positive and then weaken or become negative beyond some threshold of government size or level of development. Blotted government structure poses a negative effect on economic growth as most of government expenditure is directed to cater for basic public services and needs of citizens, thus such consumption has return that diminishes and gradually becomes negative as public expenditure rises and become closer and closer substitutes for private

expenditure, hence negatively affect the economic growth. It is for this reason that the size of public sector must be kept at a minimum size to allow the private sector to grow and develop and contribute enormously to the economic growth. The study concludes that consumption has a range of different effects from significantly positive to significantly negative, depending on the relative size of the public sector and the level of per capita GDP.

A study by Hundie (2014) to determine the causal relationship among savings, investment and economic growth in Ethiopia for the time series spanning from 1969 to 2011 by using ARDL bounds test yielded the following. The result of the investigation shows that there is long run relationship among the three variables (savings, investment and economic growth) when GDP is taken as dependent variable, while savings and investment remain independent variables. The result also show that investment has significant positive effect on economic growth in Ethiopia both in the short run and in the long run, while the effect of savings on economic growth is statistically insignificant.

The plethora of empirical literature on savings and investment discussed above are briefly presented on Table 2 below from which it is clear that different combinations yielded almost the same results by researchers quoted in the literature review of this paper, indicating unidirectional between savings and economic growth (Economic growth granger causal savings).

Table 1: Summary of findings on the relationship of some economic variables

Author & year	**Country & Period**	**Methodology & variables**	**Key findings**
Jagadeesh (2015)	Botswana: 1980-2013	ARDL • savings, • GDP, • investment	There is a positive and strong relationship between saving and GDP.
Al-Afeef and Al-Qudah (2015)	Jordan: 1980-2013	VECM • GDP, • FDI, • Savings	long run relationship among GDP, FDI & Saving; but Saving and FDI was negative
Ogbokor and Musilika (2014)	Namibia: 1995-2011	VAR, ECM and Engle-granger causality test • Saving • investment	Unidirectional causal relationship from Saving to Investment.

Hundie (2014)	Nigeria: 1969-2011	VAR and ARDL • GDP, • Saving, • Labour, • Investment, • Human capital	Savings positively impact investment, then investment positively impact GDP. However, savings has insignificant impact on GDP.
Nwanne (2014)	Nigeria: 1981-2014	VAR • Savings, • Investment and • GDP	long run relationship among savings, investment and GDP. Savings has negative effect on GDP, while investment as a positive effect on GDP.
Eita (2013)	Namibia: 1971-2010	Co-integration & Engle-Granger two step estimation • Saving, • investment, • interest rates & • openness of the economy	Mixed results, excess saving results in outflow of capital but less effect on investment.
Nghifenwa (2009)	Namibia: 1970-2006	OLS & ECM • Saving • Investment • Interest rate	Accumulated domestic saving can be used for investment & which contribute positively to GDP.
Sheehey (1993)	102 different countries: 1960-1981	Regression and differencing variables • GDP • Saving • Consumption • Investment	In a long run, the blotted government structure poses a negative effect on GDP, as much of government expenditure goes for consumption.

Source: Author's compilation of other literature sources findings

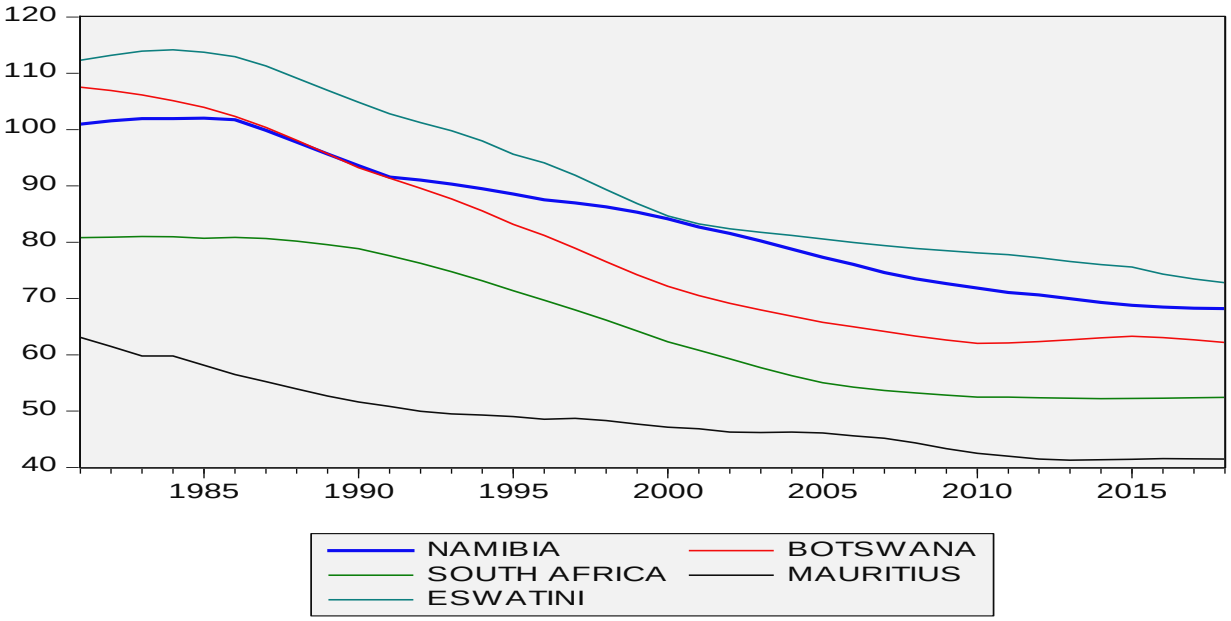
Section 3: Comparison with SADC Peers

3.1 Savings and Investment as a driver of Socio-economic Development

According to the life-cycle income hypothesis, a high population growth with all things being constant has a negative impact on aggregate saving as it increases the dependency ratio. Dependency ratio can be defined as the proportion of the economically inactive population to the economically active population in an economy, usually, 0-14 years and senior citizens older than 60 years. According to Michalos (2014), the dependency ratio is defined as the number of children (0-14 years old) related to the working-age population (15-64 years old). Hence, the higher the number of dependents in a household, the lower the chances for such a household to be able to save. In other words, a high dependency ratio negatively affects aggregate saving because it increases the level of consumption in a household, which means that the Marginal Propensity to Consume (MPC) increases and as such reduces the Marginal Propensity to Save (MPS). MPS can be defined as the ability for an individual to save a portion of a dollar increase in their income. MPC can be defined as a portion spent given a unit increase in the individual's income. Generally, MPC+MPS=1, which means that income is either consumed or saved and if MPC increases (decreases) then MPS will fall (increase). Namibia's dependency ratio of 70% is much higher for households to realize saving (Namibia Statistics Agency, 2016).

The indication for the SADC member countries is that the dependency ratio has been declining for all member states since 2000 owing to an increase in the level of income, a decline in population growth as well as increase in the working population (labour force) relative to the non-working age population (children and elders). Figure 3 below shows the dependency ratio of selected Southern Africa Development Community (SADC) member states including Namibia, Mauritius, Botswana, Eswatini and South Africa from 1981 to 2018. Namibia, as the reference country, is represented by a thick solid blue line.

Figure 3: Trends of population dependency ratios (%) for SADC member states



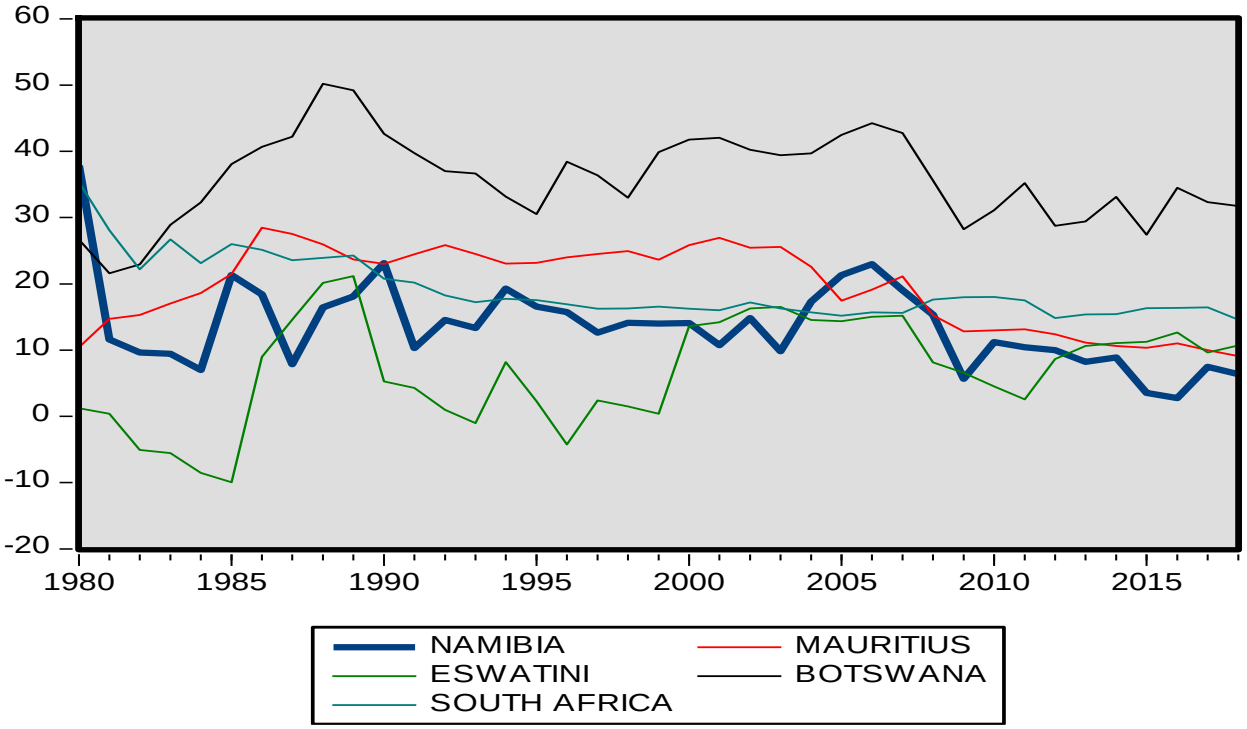
Sources: United Nations departments

On average, the country which recorded the highest dependency ratio during the review period (1981-2018) is Eswatini (88.8%), followed by Namibia (84.26%), while Mauritius recorded the lowest (43.22%). As can be observed in *figure 3* above, Eswatini registered its highest dependency ratio (114.15%) in 1984 with the lowest (72.79%) in 2018. Namibia recorded its highest dependency ratio (102.02%) in 1985 and a lowest (68.21%) in 2018. Contrary, Mauritius recorded a highest (63.07%) in 1981, and a lowest (41.46%) in 2018. The dependency ratios described above shows much pressure each economy faces in supporting its non-productive population, and this has a negative impact on saving per household in an economy.

3.1.1 Namibia savings rate trend and peers during 1980-2018

Figure 4 below shows Namibia's savings rate compared to the three SADC peers (Botswana, Mauritius and Eswatini) with similar social and economic characteristics. Two major variables that would be directly linked to savings and make comparison of these countries better are GDP and population size by 2018. Namibia's GDP was estimated to be around US$14 billion with a population of 2.5 million, while that of Botswana at US$18 billion with a population of 2.25 million people, Mauritius US$14 billion and a population of 1.26 million people, and Eswatini US$4 billion and a population of 1.36 million people in the same year.

Figure 4: Namibia's Savings (as % of GDP) among peers



Source: World Bank Data

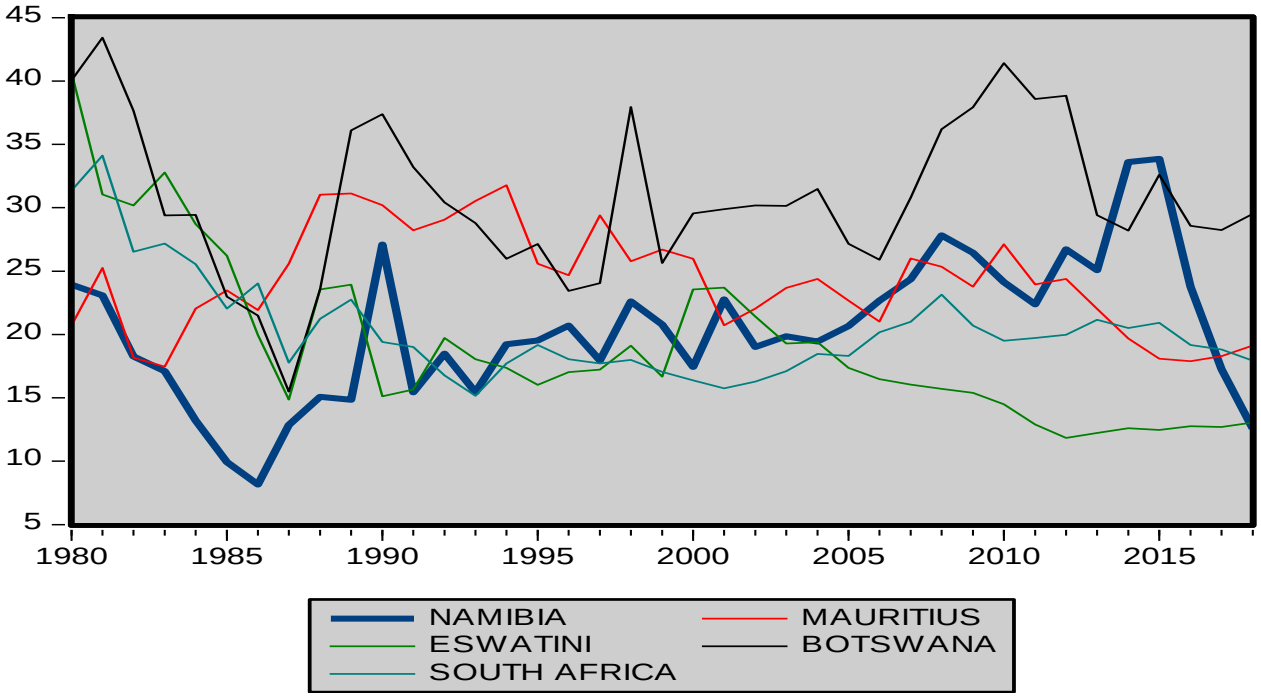
Namibia's GDS was the highest among the selected SADC peers in 1980 at 37.8% of GDP followed by Botswana at 26.67% of GDP the same year. However, Namibia's rate fell significantly in the following years contrary to that of Botswana and Mauritius from 1980 to 2018. For instance, GDS decreased to 11.6% of GDP in 1981, this trend has continued to fluctuate with the lowest rate (2.7 %) recorded in 2016 from a 3.5% in 2015.

The depression in savings for Namibia in 2015 and 2016 could be a result of the fluctuation in the prices of minerals in the global market coupled with domestic fiscal policy (Budget consolidation) measure that has been undertaken by the government that has had several spillover effects such as loss of jobs and dissaving by firms in the economy. Overall, there has been a decline in savings among the selected countries during the period under review, with Namibia's savings rate recording the second lowest after Eswatini. The series shows among other that Namibians consume more of their disposable income, while saving is less comparing with the peer countries.

3.1.2 Namibia's investment rate among peers

Figure 5 shows the rate of investment (as % of GDP) among the selected four SADC peer countries (Namibia, Botswana, Mauritius, Eswatini) during 1980 to 2018, since these countries have similar economic characteristics.

Figure 5:Namibia's investment (as % GDP) among peers



Sources: World Bank Data

Although there have been some fluctuations regarding investment (% of GDP) among peer states, on average Namibia has had the lowest investment rate for the most of the period under consideration. Botswana had the highest investment rate, followed by Mauritius, while Eswatini recorded the lowest. Namibia experienced a construction boom as a result of significant investments in the mining sector pre-2015. Although most of the countries' rate of investment have shown a slight recovery after 2015, for Namibia's investment as a percentage of GDP fell significantly. The decrease in investment could be attributed to the end of the construction boom and the fiscal (budget) consolidation measure such as a cut on government spending which resulted in a reduction on capital investment. The fiscal consolidation is put in place to curb the escalating public debt, at the same time to also allow the dwindling revenue by the government to pick up.

Section 4: Methodology

4.1 Data

This study used variables such as Gross Domestic Product growth rate as a dependent variable, Gross Domestic Saving, Gross Fixed Capital Formation (Investment), Export Import Ratio and Total Consumption in the economy as independent variables. Thus, GDP growth rate is assumed as function of independent variable. GDP can be defined as a measure of the value of final goods and services produced in a country over a period usually a year, NSA (2019). Total Consumption is the total expenditure spent on the final goods and services in an economy by both household and government over a period of time such as a year, NSA (2019). Gross Capital Fixed Formation also known as investment is the total value of a producer's acquisitions, less disposals, of fixed assets during the accounting period plus certain additions to the value of non-produced assets realized by the productive activity of institutional units, NSA (2019). Import –Export ratio refers to the ratio of the value of exported goods and services to imported goods and services of the country involved in the international trade World Bank (2018). Gross Domestic Saving is calculated as the difference between gross disposable income and final consumption, NSA (2019).

The study used time[2] series data for the purpose of analysing the impact of savings and investments in the Namibian economy. This is a desk research and uses secondary annual time series data for the period spanning from 1980 to 2016. Several sources of data were used for the purpose of the analysis, and these are: The International Monetary Fund (IMF) database, Namibia Statistics Agency (NSA), World Bank and Bank of Namibia (BoN). In line with similar studies, the study adopted ARDL as the appropriate econometric technique to investigate the impact of saving and investment for Namibia. [3]The researchers used E-views 11 software for econometric analysis of the time series data collected. Furthermore, the data was tested for stationarity/stability using the Unit root test; Auto-Regressive Distributed Lag (ARDL).

The general model is as presented below.

$$GDP = f(GDS, INV, ExpImp\_ratio, CON) \quad \ldots\ldots (3)$$

[2] Time series is an observation indexed in time order, generally time series is a sequence taken at successive equally spaced points in time, (Gujarati, 2009).

[3] Time series data are generally assumed to be stationary and thus stationarity needs to be tested for, due to the nature of the data used.

Where: GDP = Gross Domestic Product; F= is a functional relationship; GDS = Gross Domestic Saving; INV = Gross Fixed Capital Formation; CON = Aggregate consumption

4.3 Model Specifications

The study analyses the impact of savings and investments on economic growth using an Autoregressive Distributed Lag (ARDL) model. ARDL models are linear time series models in which both the dependent and independent variables are related not only contemporaneously, but across historical (lagged) values as well. More specifically, if y_t is the dependent variable and $x_1, \dots, x_k$ are k explanatory variables, the general mathematical specification of the ARDL $(p, q_1, \dots, q_k)$ model is given by:

$$y_t = a_0 + a_1 t + \sum_{i=1}^{p} \varphi_i y_{t-1} + \sum_{j=1}^{k} \sum_{l_j=0}^{q_j} \beta_{j,l_j} x_{j,t-l_j} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where ε_t are the time dependent innovations (i.e., error term), a_0 is a constant term, and a_1, φ_i, and β_{j,l_j} are respectively the coefficients associated with a linear trend, lags of dependent variable, y_t, and lags of the k regressors $x_{j,t}$ for j = 1,….k.

Following Emeka and Aham (Uko, 2016), this study used the ARDL model to determine the impacts of saving and investment on economic growth using GDP as proxy. The study used also variables such as Repo-rate, Consumption and Import as control variables in the model.

$$\Delta \mathrm{GDP_t} = \beta_0 + \Delta\beta_1 \mathrm{GDS_t} + \Delta\beta_2 \mathrm{INV_t} + \Delta\beta_3 \mathrm{IM_t} + \Delta\beta_4 \mathrm{R_t} + \Delta\beta_5 \mathrm{CON_t} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where *t* denotes time and $\Delta \mathrm{GDP_t}$ is explains the change in economic growth or Gross Domestic Product at time *t* while β_0 is a constant coefficient. $\Delta\beta_1 \mathrm{GDS_t}$ is change in gross domestic saving at time *t* while β_1 is the gross domestic saving coefficient. $\Delta\beta_2 \mathrm{INV_t}$ Is the change in investment in Namibia at time *t* while β_2 is the investment coefficient. $\Delta\beta_3 \mathrm{IM_t}$ Can be explained as the change in import at time t while β_3 is the imports coefficient. Furthermore, $\Delta\beta_4 \mathrm{R_t}$ is explained as a change in repo rate at time *t* and β_4 is the coefficient of repo rate. $\Delta \mathrm{CON_t}$ Is explained as a change in aggregate consumption at time *t* and β_5 is the coefficient of consumption. Lastly, ε_t explains the error term or the summation of all other significant variables that are not captured by the model at time *t*.

4.4 Unit Root Test

The unit root test is used to determine the stationarity properties of the data or in other words the order of integration of the data as a general norm in econometric modelling. The presence of unit roots means that the data is not stationary and thus can cause spurious results that might lead to miss-judgement. To avoid spurious regression, non-stationary data should be made stationary through either differencing or de-trending (Sheefeni, 2017). As a result of the data being a time series, there is a risk that due to the changes over the years, data will not have a fixed or stationary mean (Olugbenga & Oluwole, 2008). The lack of stationarity will invalidate tests used for inference testing and will lead to spurious result hence incorrect conclusions. Against this, Augmented Dickey-Fuller (ADF) test is employed to test for unit root.

In view of this, the null hypothesis is that the variable under investigation has a unit root (non-stationary). The decision rule is to reject the null hypothesis if the probability is less than 0.05 at 5% significance level or alternatively if the absolute value of the t- statistic is found to be lower than the critical value, then we fail to reject the null hypothesis, and conclude that the series is non-stationary (Opperman, 2012).

4.5 Lag Selection

According to Gujarati (2003) the dependant variable (Y) depends on the regressor (X) variable, thus the variation in the dependent variable (Y) is due to the change in (X) with a lapse of time. Such a time lapse of time is called lag. Therefore, in time series analysis a level of care must be taken when including lags in a model. Failure to identify the correct the number of lags has a potential to reduce the degree of freedom in a model. Such an error can lead to model misspecification and somewhat unstable statistical inference (Wooldridge, 2012). The rule of lag selection says that we should select the lag level with the lowest Akaike Info Criterion (AIC) and Schwarz Info Criterion (AIC).

4.6 Auto-Regressive Distributed Lag (ARDL) model

The bounds test approach to co-integration also referred to as an Auto-Regressive Distributed Lag (ARDL) model is a combination between the distributed lag model and autoregressive model because it include not only the present value, but also the past values of the explanatory variables (X) and also include one or more value of the past (lag) of the dependent variable as variables explanatory Gujarati (2003). According to Gujarati (2009), “this approach is used in research for three reasons: Firstly, it is argued to be more efficient in small sample sizes as is the case with this

study. Secondly, it is simpler when compared to other co-integration techniques like the Johansen co-integration test as the co-integration among variables in the ARDL model can be estimated by the Ordinary Least Squares (OLS) method once the order of lags has been chosen. Thirdly, this method does not require pre-testing of the variables to determine if there is unit root in the variables or order of integration to find if long-run relationship exists among the variables. Though ARDL is found to be simple and easy and does not require pre-testing for co-integration, it is however not appropriate to utilize when variables are integrated of order two (I(2)) or more. Thus, ARDL can be utilized when variables are integrated of order zero (I(0)) and order one (I(1)) only, as the case for this study. Therefore, the process can proceed and run the model.

Section 5: Analysis and result discussion

5.1. Unit Roots test results

After testing for unit root, all variables were found to be stationary in first difference except for GDP which is found to be stationary in levels. Hence, this study uses ARDL model to determine the impact of saving and investment on GDP.

Table 2: Unit root Testing for Co-integration Analysis

Variables	**Level**	**1st difference**	**Order of integration**
Log(GDP)	(0.0204)*, **, ***	NA	I(0)
Log(Cons)	(0.0594) ***	(0.0001)*, **, ***	I(1)
Log(GDS)	(0.0227) **,***	(0.0000)*, **, ***	I(1)
Log(ExIm Ratio)	(0.0204) **,***	(0.0000)*, **, ***	I(1)
Investment (Inv)	(0.9864)	(0.0004) *, **, ***	I(1)

*Notes: * indicate significance at 1% level. ** indicate significance at 5% level. *** indicate significance at 10% level.*

5.2 Lag Selection

The rule of lag selection says that select the lag level with the lowest AIC and SIC and the result from our output is given on the table below.

Table 3: Lag selection

Info Criterion	**1 Lag**	**2 Lag**	**3 Lag**
Akaike Info Criterion (AIC)	4.71	4.93	5.00
Schwarz Info Criterion (SIC)	5.28	5.77	6.13

The lag with the lowest AIC and SIC is the first lag and this is the best model to be selected as informed by AIC= 4.71 and SIC= 5.28. The next step in the estimation process is to perform bound testing using Pesaran and Narayan (2005) table.

5.3. The ARDL Bound Cointegration Test model:

The general ARDL model is presented below:

$$\Delta GDP_t = c + \beta_1 GDP_{t-1} + \beta_2 GDS_{t-1} + \beta_3 INV_{t-1} + \beta_4 IM_{t-1} + \beta_5 R_{t-1} + \beta_6 CON_{t-1} + \sum_{i=1}^{P} \alpha_{1i} \Delta GDP_{t-i} + \sum_{i=0}^{P} \alpha_{2i} \Delta GDS_{t-i} + \sum_{i=0}^{P} \alpha_{3i} \Delta INV_{t-i} + \sum_{i=0}^{P} \alpha_{4i} \Delta IM_{t-i} + \sum_{i=0}^{P} \alpha_{5i} \Delta R_{t-i} + \sum_{i=0}^{P} \alpha_{6i} \Delta CON_{t-i} \varepsilon_t \quad (6)$$

The ARDL regression model Results:

Table 4: Regression results

Variables	Coefficient	Standard Error	T-Statistic	Probability*
LOG(REALGDP(-1))	0.960356	0.157258	6.106887	0.0000
LOG(REALGDP(-2))	-0.518081	0.131704	-3.933681	0.0009
LOG(TOTALCONS)	0.486913	0.077461	6.28591	0.0000
LOG(TOTALCONS(-1))	-0.05668	0.091813	-0.61734	0.5443
LOG(TOTALCONS(-2))	-0.211429	0.074108	-2.852986	0.0102
LOG(TOTALCONS(-3))	0.352819	0.06554	5.38325	0.0000
LOG(TOTALCONS(-4))	-0.106048	0.053907	-1.967227	0.0639
LOG(GFCF_ADJUSTED)	0.069096	0.027725	2.492197	0.0221
LOG(GFCF_ADJUSTED(-1))	0.096776	0.035059	2.760395	0.0125
LOG(GFCF_ADJUSTED(-2))	0.023154	0.025389	0.911975	0.3732
LOG(GFCF_ADJUSTED(-3))	-0.038171	0.021536	-1.772399	0.0924
LOG(GFCF_ADJUSTED(-4))	-0.042559	0.020133	-2.113928	0.048
LOG(GDS_ESTIMATE)	0.040958	0.01004	4.079598	0.0006
LOG(EXPIMRATIO)	0.260528	0.045867	5.680017	0.0000
LOG(EXPIMRATIO(-1))	-0.112411	0.054947	-2.045808	0.0549
@TREND	-0.003176	0.002876	-1.104153	0.2833
R-squared	0.999408	Mean dependent variable	11.2916	
Adjusted R-squared	0.99891	S.D. dependent variable	0.406353	
S.E. of regression	0.013416	Akaike info criterion	-5.479335	

Sum squared resid	0.00342	Schwarz criterion	-4.731562
Log likelihood	115.628	Hannan-Quinn criterio.	-5.218342
F-statistic	2005.555	Durbin-Watson stat	2.123351
Prob (F-statistic)	0.000000		

*Notes: * indicate significance at 1% level. ** indicate significance at 5% level. *** indicate significance at 10% level.*

The regression output indicates that there is a significant and positive relationship between current Gross Domestic Product (GDP) rate and Investment (INV), Consumption (Cons), Gross Domestic Saving (GDS) and Export Import ratio (ExpImp). This means units increase in variables such INV, Consumption, Export-Import ratio, GDS and GDP from the previous year will bring about a unit increase in growth in GDP in Namibia.

The model's R-square of 0.999408 indicates that 99% of the variations in current GDP growth rate is explained by the changes in the variables included in the model. The F-statistics is significant at 0.000000 and this shows that the model is a good fit. The model has also satisfied all other diagnostics such as stability, heteroskedasticity, normality as well as serial correlation.

5.4. Short Run and Long Run Test of Cointegration

The cointegration test rule states that if the F-statistics should be compared to the Lower Bound I (0) and Upper Bound (1) values at all level of significance. If the F-statistics is lower than the I(0), then there is a short run cointegration and if the F-statistics is greater than the I(1), then there is long run cointegration in the system.

Table 5: Bound Test Table

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Significance.**	**I(0)**	**I(1)**
F-statistic	7.137422	10%	3.03	4.06
K	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72
t-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Significance.**	**I(0)**	**I(1)**
t-statistic	-6.572685	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

*Notes: *****indicate significance at 1% level. ******indicate significance at 5% level. *******indicate significance at 10% level. The critical values are taken from Narayan et al. (2005) for 33 observations: Unrestricted intercept and no trend.*

Based on the parsimonious model above, the F- statistics = 7.137422 thus, it is found to be higher than the upper bound critical value of 4.06 at 10% level of significance for case 35: unrestricted intercept and no trend, with four regressors (k=4) taken from Narayan (2005) as represented in Table 5 above. Thus, the null hypothesis of no cointegration is rejected and we establish that there is a long run cointegration relationship between GDP and its determinants namely, Investment, Gross Domestic Saving, Export Import ratio and Consumption.

5.5. Speed of Adjustment Regression

The Error Correction Model (ECt) is used to test the speed of adjustment. The Speed of adjustment indicates the distance away from the equilibrium given shocks in the model. The model has to satisfy two conditions in order for it to be regarded as fit. The first condition is that the ECt coefficient must be negative and the second condition is that the coefficient should be significant. The model used for the speed of adjustment is as given below followed by the output regression results.

$$\Delta GDP_t = \beta_0 + \sum_{i=0}^{P} \alpha_{2i}\, \Delta GDS_{t-i} + \sum_{i=0}^{q} \alpha_{3i}\, \Delta INV_{t-i} + \sum_{i=0}^{r} \alpha_{4i}\, \Delta ExpImRatio_{t-i} + \sum_{i=0}^{t} \alpha_{5i}\, \Delta CON_{t-i} + ECT_{t-1} + \mu_{1i} \quad (7)$$

*EC= LOG(REALGDP) - (0.8348*LOG(TOTALCONS) + 0.1942*LOG(GFCF_ADJUSTED) + 0.0734*LOG(GDS_ESTIMATE) + 0.2656*LOG(EXPIMRATIO))* ..... *(8)*

Table 6: Speed of adjustment regression

Variable	Coefficient	Std. Error	t-Statistic	Probability.
C	-0.224414	0.036215	-6.196770	0.0000
@TREND	-0.003176	0.000561	-5.662237	0.0000
DLOG(REALGDP(-1))	0.518081	0.109429	4.734403	0.0001
DLOG(TOTALCONS)	0.486913	0.062231	7.824283	0.0000
DLOG(TOTALCONS(-1))	-0.035341	0.048128	-0.734307	0.4717
DLOG(TOTALCONS(-2))	-0.246770	0.043985	-5.610279	0.0000
DLOG(TOTALCONS(-3))	0.106048	0.039194	2.705719	0.0140
DLOG(GFCF_ADJUSTED)	0.069096	0.018617	3.711330	0.0015
DLOG(GFCF_ADJUSTED(-1))	0.057576	0.015559	3.700418	0.0015
DLOG(GFCF_ADJUSTED(-2))	0.080730	0.015350	5.259283	0.0000
DLOG(GFCF_ADJUSTED(-3))	0.042559	0.015729	2.705728	0.0140
DLOG(EXPIMRATIO)	0.260528	0.031339	8.313159	0.0000
ECT(-1)*	**-0.557726**	**0.084855**	**-6.572685**	**0.0000**
R-squared	0.873813	Mean dependent var	0.032883	
Adjusted R-squared	0.807976	S.D. dependent var	0.027827	
S.E. of regression	0.012194	Akaike info criterion	-5.701557	
Sum squared resid	0.003420	Schwarz criterion	-5.129731	

Log likelihood	115.6280	Hannan-Quinn criter.	-5.501974	
F-statistic	13.27241	Durbin-Watson stat	2.123351	
Prob(F-statistic)	0.000000			

*Notes: **indicate significance at 1% level. ****indicate significance at 5% level. *****indicate significance at 10% level. The critical values are taken from Narayan et al. (2005) for 33 observations: Unrestricted intercept and no trend.*

The coefficient of the error correction term ECT_{t-1} is negative and significant at both 5% and 10% level of significance. This indicates that more than 56% of the disequilibrium between GDP and all the variables in the model is corrected within one period if the economy experience a shock. The F-statistic is significant at 10% level of significance. After having obtained the results and concluded that the speed of adjustment coefficient meets all requirements i.e. the negative sign and that it is significant, proceed to test the model for serial correlation, heteroscedasticity and stability as is required.

Cointegration Test

From the test of cointegration, the model has a no short run but a long run cointegration. Therefore, the next step is to test whether the model exhibits a normal or spurious cointegration. Thus the t-statistics below the lower bound I(0) indicates a spurious cointegration while if the t-statistics above the upper bound I(1)indicates a normal cointegration at 10%, 5% or 1% level of significance. If the t-statistics is falling between the lower and upper bound levels, then it is inconclusive.

Table 7: Cointegration Table

t-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	**Value**	**Significance.**	**I(0)**	**I(1)**
t-statistic	-4.089549	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

*Notes: **indicate significance at 1% level. ****indicate significance at 5% level. *****indicate significance at 10% level. The critical values are taken from Narayan et al. (2005) for 33 observations: Unrestricted intercept and no trend.*

Thus, using the data from the given table, the model exhibits normal cointegration. Hence we accept the model and proceed to specifying the long run model.

5.6. Long Run Coefficients

The following coefficients of the variables for the long run relation using the ARDL model were obtained:

Table 8: Long run coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOTALCONS)	0.834771	0.154242	5.412088	0.0000
LOG(GFCF_ADJUSTED)	0.194173	0.044639	4.349860	0.0003
LOG(GDS_ESTIMATE)	0.073437	0.025572	2.871820	0.0098
LOG(EXPIMRATIO)	0.265573	0.097998	2.709991	0.0139

*Notes: *****indicate significance at 1% level. ******indicate significance at 5% level. *******indicate significance at 10% level. The critical values are taken from Narayan et al. (2005) for 33 observations: Unrestricted intercept and no trend.*

Therefore, the long run relation model:

$$logGDP_t = 0.834771 logCons_t + 0.194173 logInv_t + 0.073437 logGDS_t + 0.265573 logExpImpRatio_t + \varepsilon_t \quad (9)$$

The study established that there is a long run cointegration relationship between GDP and its determinants namely; Gross Domestic Investment (GDI), Import Export ratio, Gross domestic Saving and Consumption. Variables such as Export Import ratio, investment, Gross Domestic Saving and consumption are found to be significant in this model. Export Import ratio is significant with a coefficient of 0.265573. This implies that a percentage increase in the export relative to imports will lead to 0.27 percentage increase in GDP growth rate in the long run; it shows a positive effect of exports on the economy which leads to money inflow during exportation of goods and services.

Investment is significant with a coefficient of 0.194173 and this implies that a percentage increase in national investment or gross capital formation will lead to 0.19 percentage increase in GDP growth rate in the long run, implying that domestic investment contributes to the growth of the economy, thus subsidizes to employment creation and uplift the living standards of citizens.

Consumption is found to be significant with a coefficient of 0.834771, which implies that a percentage increase in national consumption will increase GDP growth rate by 0.83 percentages in the long run. The outcome is in support of the economic theory which supports consumption as it positively contributes to economic growth.

Gross Domestic Saving is significant with a coefficient of 0.073437and this implies that a percentage increase in Gross Domestic Saving will lead to 0.07 percentage increase in GDP growth rate in the long run, implying that GDS contributes to the growth of the economy.

Section 6: Conclusions and Recommendations

6.1. Conclusions

Several literatures have found mixed impacts between GDP, saving and investment. Several studies have established the role saving and investment plays in promoting economic growth of any nation.

Like Al-Afeef and Al-Qudah (2015), this study's results concur with findings by Eita (2013) and Jagadeesh (2015) that there is a positive and significant relationship between saving, investment and GDP. The study's finding seems to be in disagreement with the results by Nghifenwa (2009) that somehow suggest that the relationship between savings and GDP is not a direct one because only after savings accumulation one will invest, therefore, investment is the only variable with a direct impact on GDP. This study concludes that there is a positive, direct and significant impact running from savings to GDP in Namibia.

Furthermore, the cited theories of savings and investment suggest that saving causes investment and thereby increases economic growth. This study's results are in support of the theory of investment in the case of Namibian economy. Data has shown that investment directly drives the economic growth. Additionally, like Nyanne (2014), the empirical results in this study found that there is a long run cointegration between saving, investment and GDP in Namibia. However, the issue of long run relationship between savings, investment and economic growth remains a bone of contention both theoretically and empirically as they show mixed results; as this defers from one country to the other due to specific country data collection methodologies.

In the same vein, empirical literatures reviewed also shows some mixed findings and do not provide conclusive empirical evidences on the long run relationship. Most of the existing empirical literature studies do not show a strong relationship between savings and economic growth contrary to what has been reviewed by this study for Namibia.

Consumption is found to have a positive and significant impact on GDP in Namibia. Thus, there is a need to continue supporting domestic consumption together with other variables to achieve economic growth in both short and long run in Namibia. Furthermore, Export relative to import

ratio is found to be positive and significant in Namibia. Thus, an increase in exported goods and services relative to imported goods and services has positive impact on GDP growth rate in Namibia. Therefore, there is a need to encourage local goods manufacturing and local consumption to reduce imports of goods and services because such will bring about improved living standard as well as the much-needed foreign currency in the economy.

The study concludes that a percent increase in investment will result in 0.19 percent GDP growth in a long run. The study also concludes that a percentage increase in consumption leads to 0.84 percent increase to GDP in a long run. Furthermore, a percentage increase in either import export ratio or gross domestic savings will lead to 0.27 percent and 0.07 percent increase in GDP growth rate in Namibia in a long run respectively.

Other findings of note from the study are that saving and investment in Namibia is found to be second lowest and lowest in comparison to peer countries during the period under review. Furthermore, import and dependency ratio is found to be high hence negatively impacting the saving ratio in the country. A high dependency ratio induces much expenditure on government for basic needs of such unproductive population cohort.

6.2. Recommendations

Based on the analysis and findings of this study, the following recommendations are made:

1. Increased national exports increase economic growth in the long run, as this leads to money inflow during exportation of goods and services, hence the study recommends an increased manufacturing or production of domestic commodities and services.

2. The government to expedite the finalization of Namibia Investment Promotion Act 2016 as this will create conducive and attractive environment for more investors as this has come out to be significant in growing the economy. Furthermore, helping clients retain and expand FDI by strengthening investor confidence through such steps as reducing the risk of expropriation and by promoting best practices in investment grievance management.

3. Government should create favorable condition in order to mobilize domestic savings by small scale businesses and individual depositors. Improving the effectiveness of policies and efforts aimed at attracting and facilitating saving and FDI, including establishing enhanced investor entry regimes, streamlining investment procedures, and enhancing investment promotion capacity.

4. Consumption and dependent ratio are found to be correlated and high in Namibia. It is therefore imperative to encourage saving and entrepreneurship for this cohort in order to reduce dependency.

5. Intensify the financial literacy outreach program to the masses especially to the informal sector so that savings can be improved.

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8. Annexures from model output

8.1 Diagnostic Checks of the ARDL bounds model:

The diagnostic checks tested for serial correlation, Heteroskedasticity and normality of the model.

Annexure table 8.1: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.013128	Prob. F(1,22)	0.9098
Obs*R-squared	0.021470	Prob. Chi-Square(1)	0.8835

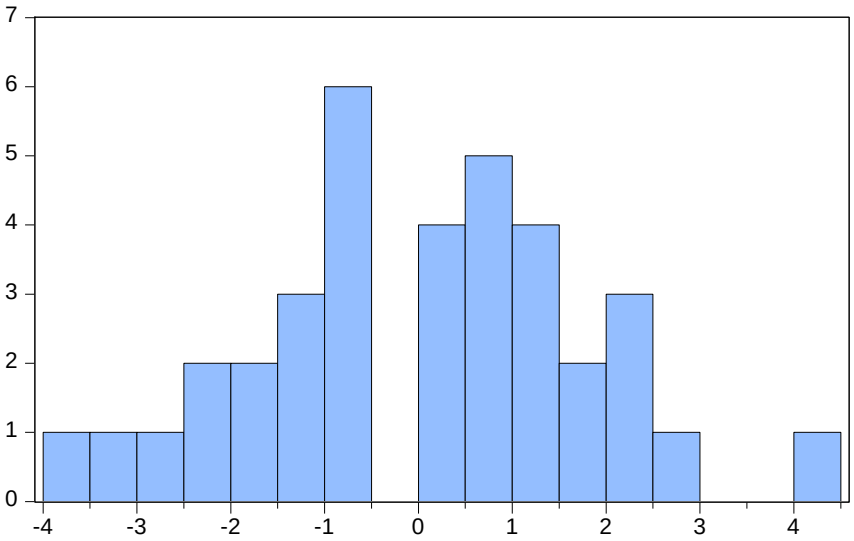
The model was tested for Serial Correlation using the Breusch-Godfrey test. The LM test indicates that there is no serial correlation since P-value 0.8835 > 0.05.

Annexure table 8.2: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.450822	Prob. F(12,23)	0.9234
Obs*R-squared	6.855192	Prob. Chi-Square (12)	0.8670
Scaled explained SS	2.120740	Prob. Chi-Square (12)	0.9992

The model was tested for Heteroskedasticity using the Breusch-Pagan-Godfrey test. The test indicates that there is no serial correlation since P-value 0.8670 > 0.05.

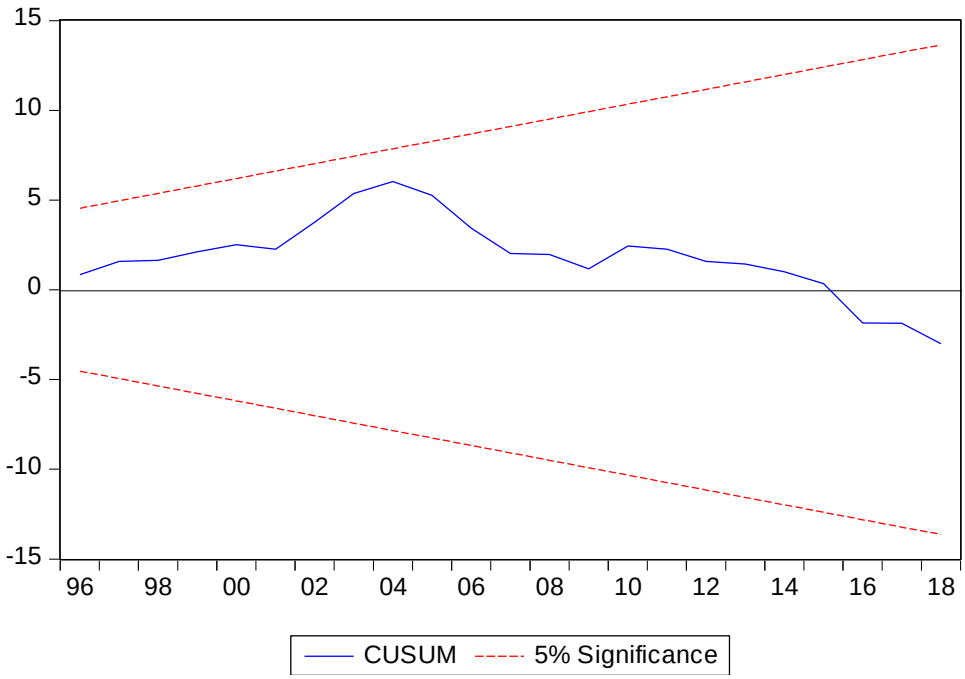
Annexure figure 8.1: Test of Normality



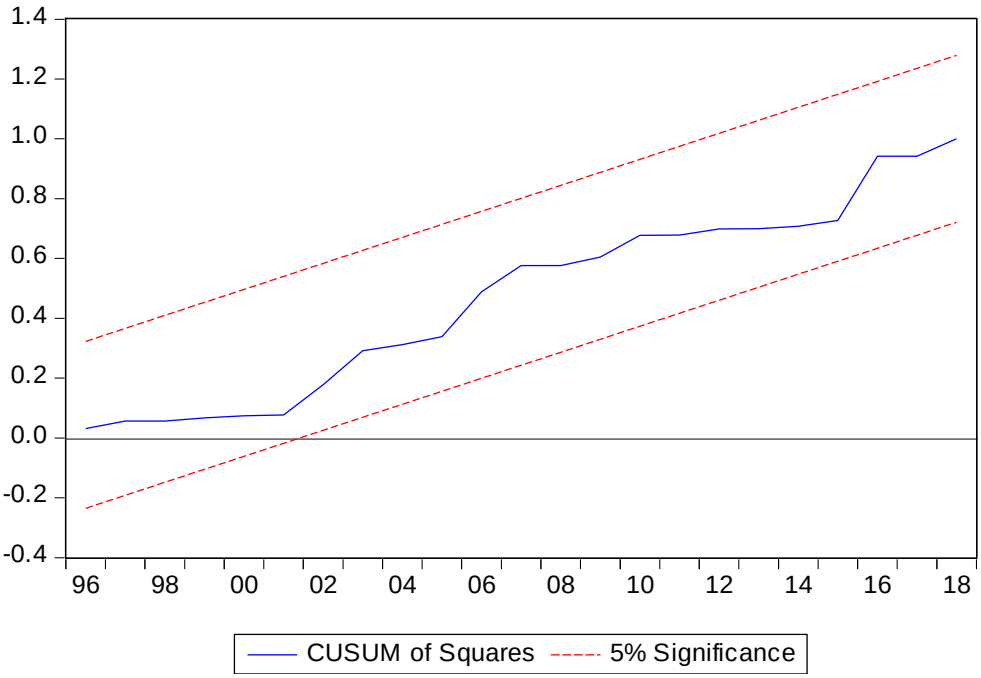
Series: Residuals	
Sample 1983 2018	
Observations 36	
Mean	-1.98e-15
Median	0.270563
Maximum	4.009703
Minimum	-3.746699
Std. Dev.	1.803259
Skewness	-0.104417
Kurtosis	2.515818
Jarque-Bera	0.417066
Probability	0.811774

The model was tested for Normality distribution of the residual. The test indicates that the no residuals are normally distributed since P-value 0.81 > 0.05.

Annexure figure 8.2: Model Stability CUSUM Test



Annexure figure 8.3: CUSUM of Square Test of Normality



Both test of stability using the CUSUM test indicates that the model is stable.

Annexure table 8.3: Wald Test: Testing for long run cointegration

Equation: Untitled

Test Statistic	Value	Df	Probability
F-statistic	4.149910	(6, 23)	0.0057
Chi-square	24.89946	6	0.0004

Null Hypothesis: C(8)=C(9)=C(10)=C(11)=C(12)=C(13)=0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(8)	-0.916667	0.277400

C(9)	0.321650	0.214365
C(10)	0.061975	0.115810
C(11)	0.073510	0.093228
C(12)	0.092835	0.115443
C(13)	0.175571	0.158505

Restrictions are linear in coefficients.

Based on the parsimonious model above, the calculated F-statistics value of 4.149910 is found to be higher than the upper bound critical value of 3.763 at 10% level of significance for case 35: unrestricted intercept and no trend, with five regressors (k=5) taken from Narayan (2005) as presented in the Table below. Thus, the null hypothesis of no cointegration is rejected and we establish that there is a long run cointegration relationship between GDP and its determinants namely, Investment, Gross Domestic Saving, Imports, Consumption and Repo rate.

Parameterization of ARDL Model into Error Correction Model

The ARDL long run model is represented as below. Thus we proceed to regress for the speed of adjustment that we have the equation as given below.

$$\Delta GDP_t = \beta_0 + \sum_{i=0}^{P} \alpha_{2i}\, \Delta GDS_{t-i} + \sum_{i=0}^{q} \alpha_{3i}\, \Delta INV_{t-i} + \sum_{i=0}^{r} \alpha_{4i}\, \Delta IM_{t-i} + \sum_{i=0}^{s} \alpha_{5i}\, \Delta R_{t-i} + \sum_{i=0}^{t} \alpha_{6i}\, \Delta CON_{t-i} + ECT_{t-1} + \mu_{1i} \quad \ldots\ldots (4)$$

Where:

GDP = is the Growth or Gross Domestic Product

F = is a function

GDS= Is Gross Domestic Saving

INV = is the total investment in the country

R = is the interest rate in Namibia

CON = is the aggregate consumption in Namibia

p,q,r,s,t = optimum lag length

ECT = is the speed of adjustment

μ = is the error term

Speed of adjustment regression

Our model used for the speed of adjustment is as given below followed by the output regression results.

d(gdp) c d(gdp(-1)) d(gds(-1)) d(im(-1)) d(inv(-1)) d(con01(-1)) d(r(-1)) ect(-1)

Annexure table 8.5: Speed of adjustment regression

The coefficient of the error correction term ECT_{t-1} is negative and significant at both 5% and 10% level of significance. This indicates that more than 73% of the disequilibrium between GDP and all the variables in the model is corrected within one period. The F-statistic is significant at 10% level of significance.

After we have obtained the results and concluded that the speed of adjustment coefficient meets all requirements such the negative sign and that it is significant, we proceed to test our model for serial correlation, heteroscedasticity and stability as usual.

Annexure table 8.6: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.402527	Prob. F(1,26)	0.5313
Obs*R-squared	0.533602	Prob. Chi-Square(1)	0.4651

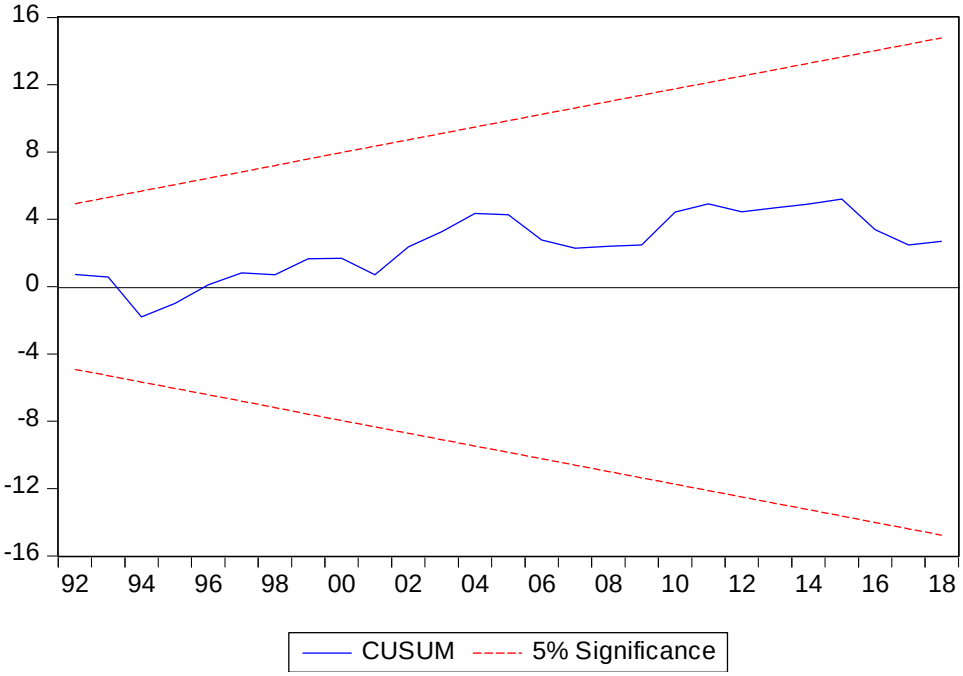
The model was tested for Serial Correlation using the Breusch-Godfrey test. The LM test indicates that there is no serial correlation since P-value 0.4651 > 0.05.

Annexure table 8.7: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.223440	Prob. F(7,27)	0.9764
Obs*R-squared	1.916490	Prob. Chi-Square(7)	0.9643
Scaled explained SS	2.821305	Prob. Chi-Square(7)	0.9010

The model was tested for Heteroskedasticity using the Breusch-Pagan-Godfrey test. The test indicates that there is no serial correlation since P-value 0.9643 > 0.05.

Annexure figure 8.4: Model Stability CUSUM Test



Test of stability using the CUSUM test indicates that the model is stable.

Short run causality test

We tested for short run causality running from either variable to GDP or visa vie. Our data indicated that there is no short run causality running from either variable to GDP or from GDP to the variables included in the model at 5% level of significance. However, GDP and GDS are found to have short run causality at 10% level of significance in this model.

Annexure table 8.15: Wald Test: (c(1))/(1-c(2))=0

Delta method computed using analytic derivatives.

The long run elasticity coefficient of the constant is -0.059495 and the p-value is 0.8877>0.10 making it insignificant to determine the long run growth in GDP.

Unit Root Tests: First Difference

Null Hypothesis: Unit root (individual unit root process)
Series: REALGDP, TOTALCONS, GFCF_ADJUSTED, GDS_ESTIMATE, EXPIMRATIO
Date: 09/10/20 Time: 14:48
Sample: 1980 2019
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 186
Cross-sections included: 5

Method	Statistic	Prob.**
ADF - Fisher Chi-square	95.1111	0.0000
ADF - Choi Z-stat	-8.23532	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(UNTITLED)

Series	Prob.	Lag	Max Lag	Obs
D(REALGDP)	0.0204	0	9	38
D(TOTALCONS)	0.0001	0	9	38
D(GFCF_ADJUSTED)	0.0000	0	9	38
D(GDS_ESTIMATE)	0.0000	2	9	36
D(EXPIMRATIO)	0.0004	2	9	36

ARDL

Dependent Variable: LOG(REALGDP)
Method: ARDL
Date: 09/10/20 Time: 15:36
Sample (adjusted): 1984 2019
Included observations: 36 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LOG(TOTALCONS) LOG(GFCF_ADJUSTED) LOG(GDS_ESTIMATE) LOG(EXPIMRATIO)
Fixed regressors: C @TREND
Number of models evalulated: 2500
Selected Model: ARDL(2, 4, 4, 0, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(REALGDP(-1))	0.960356	0.157258	6.106887	0.0000
LOG(REALGDP(-2))	-0.518081	0.131704	-3.933681	0.0009
LOG(TOTALCONS)	0.486913	0.077461	6.285910	0.0000
LOG(TOTALCONS(-1))	-0.056680	0.091813	-0.617340	0.5443
LOG(TOTALCONS(-2))	-0.211429	0.074108	-2.852986	0.0102
LOG(TOTALCONS(-3))	0.352819	0.065540	5.383250	0.0000

LOG(TOTALCONS(-4))	-0.106048	0.053907	-1.967227	0.0639
LOG(GFCF_ADJUSTED)	0.069096	0.027725	2.492197	0.0221
LOG(GFCF_ADJUSTED(-1))	0.096776	0.035059	2.760395	0.0125
LOG(GFCF_ADJUSTED(-2))	0.023154	0.025389	0.911975	0.3732
LOG(GFCF_ADJUSTED(-3))	-0.038171	0.021536	-1.772399	0.0924
LOG(GFCF_ADJUSTED(-4))	-0.042559	0.020133	-2.113928	0.0480
LOG(GDS_ESTIMATE)	0.040958	0.010040	4.079598	0.0006
LOG(EXPIMRATIO)	0.260528	0.045867	5.680017	0.0000
LOG(EXPIMRATIO(-1))	-0.112411	0.054947	-2.045808	0.0549
C	-0.224414	0.935127	-0.239982	0.8129
@TREND	-0.003176	0.002876	-1.104153	0.2833

R-squared	0.999408	Mean dependent var	11.29160
Adjusted R-squared	0.998910	S.D. dependent var	0.406353
S.E. of regression	0.013416	Akaike info criterion	-5.479335
Sum squared resid	0.003420	Schwarz criterion	-4.731562
Log likelihood	115.6280	Hannan-Quinn criter.	-5.218342
F-statistic	2005.555	Durbin-Watson stat	2.123351
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Bound Test

ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(REALGDP)
Selected Model: ARDL(2, 4, 4, 0, 1)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 09/10/20 Time: 15:37
Sample: 1980 2019
Included observations: 36

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.224414	0.935127	-0.239982	0.8129
@TREND	-0.003176	0.002876	-1.104153	0.2833
LOG(REALGDP(-1))*	-0.557726	0.136378	-4.089549	0.0006
LOG(TOTALCONS(-1))	0.465573	0.137231	3.392614	0.0031
LOG(GFCF_ADJUSTED(-1))	0.108295	0.032725	3.309236	0.0037
LOG(GDS_ESTIMATE)**	0.040958	0.010040	4.079598	0.0006
LOG(EXPIMRATIO(-1))	0.148117	0.069043	2.145273	0.0451
DLOG(REALGDP(-1))	0.518081	0.131704	3.933681	0.0009
DLOG(TOTALCONS)	0.486913	0.077461	6.285910	0.0000
DLOG(TOTALCONS(-1))	-0.035341	0.069809	-0.506249	0.6185
DLOG(TOTALCONS(-2))	-0.246770	0.052820	-4.671953	0.0002
DLOG(TOTALCONS(-3))	0.106048	0.053907	1.967227	0.0639
DLOG(GFCF_ADJUSTED)	0.069096	0.027725	2.492197	0.0221
DLOG(GFCF_ADJUSTED(-1))	0.057576	0.024258	2.373457	0.0283
DLOG(GFCF_ADJUSTED(-2))	0.080730	0.021615	3.734906	0.0014
DLOG(GFCF_ADJUSTED(-3))	0.042559	0.020133	2.113928	0.0480
DLOG(EXPIMRATIO)	0.260528	0.045867	5.680017	0.0000

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOTALCONS)	0.834771	0.154242	5.412088	0.0000
LOG(GFCF_ADJUSTED)	0.194173	0.044639	4.349860	0.0003
LOG(GDS_ESTIMATE)	0.073437	0.025572	2.871820	0.0098
LOG(EXPIMRATIO)	0.265573	0.097998	2.709991	0.0139

EC = LOG(REALGDP) - (0.8348*LOG(TOTALCONS) + 0.1942
*LOG(GFCF_ADJUSTED) + 0.0734*LOG(GDS_ESTIMATE) + 0.2656
*LOG(EXPIMRATIO))

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.137422	10%	3.03	4.06
K	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72
			Finite Sample: n=40	
Actual Sample Size	36	10%	3.334	4.438
		5%	3.958	5.226
		1%	5.376	7.092
			Finite Sample: n=35	
		10%	3.374	4.512
		5%	4.036	5.304
		1%	5.604	7.172

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-4.089549	10%	-3.13	-4.04
		5%	-3.41	-4.36
		2.5%	-3.65	-4.62
		1%	-3.96	-4.96

ECM

ARDL Error Correction Regression
Dependent Variable: DLOG(REALGDP)
Selected Model: ARDL(2, 4, 4, 0, 1)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 09/10/20 Time: 15:39
Sample: 1980 2019
Included observations: 36

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.224414	0.036215	-6.196770	0.0000
@TREND	-0.003176	0.000561	-5.662237	0.0000
DLOG(REALGDP(-1))	0.518081	0.109429	4.734403	0.0001
DLOG(TOTALCONS)	0.486913	0.062231	7.824283	0.0000
DLOG(TOTALCONS(-1))	-0.035341	0.048128	-0.734307	0.4717
DLOG(TOTALCONS(-2))	-0.246770	0.043985	-5.610279	0.0000
DLOG(TOTALCONS(-3))	0.106048	0.039194	2.705719	0.0140
DLOG(GFCF_ADJUSTED)	0.069096	0.018617	3.711330	0.0015
DLOG(GFCF_ADJUSTED(-1))	0.057576	0.015559	3.700418	0.0015
DLOG(GFCF_ADJUSTED(-2))	0.080730	0.015350	5.259283	0.0000
DLOG(GFCF_ADJUSTED(-3))	0.042559	0.015729	2.705728	0.0140
DLOG(EXPIMRATIO)	0.260528	0.031339	8.313159	0.0000
CointEq(-1)*	-0.557726	0.084855	-6.572685	0.0000

R-squared	0.873813	Mean dependent var	0.032883
Adjusted R-squared	0.807976	S.D. dependent var	0.027827
S.E. of regression	0.012194	Akaike info criterion	-5.701557
Sum squared resid	0.003420	Schwarz criterion	-5.129731
Log likelihood	115.6280	Hannan-Quinn criter.	-5.501974
F-statistic	13.27241	Durbin-Watson stat	2.123351
Prob(F-statistic)	0.000000		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

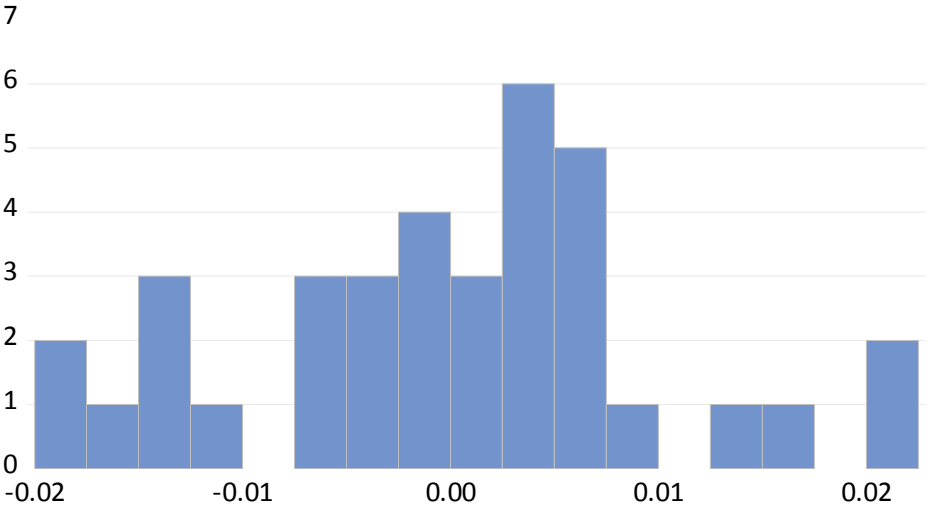
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	7.137422	10%	3.03	4.06
K	4	5%	3.47	4.57
		2.5%	3.89	5.07
		1%	4.4	5.72

t-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-6.572685	10%	-3.13	-4.04
		5%	-3.41	-4.36

2.5%	-3.65	-4.62
1%	-3.96	-4.96

Normality



Series: Residuals	
Sample 1984 2019	
Observations 36	
Mean	-9.72e-16
Median	0.000912
Maximum	0.021745
Minimum	-0.019616
Std. Dev.	0.009885
Skewness	0.068398
Kurtosis	2.848880
Jarque-Bera	0.062325
Probability	0.969318

Serial autocorrelation

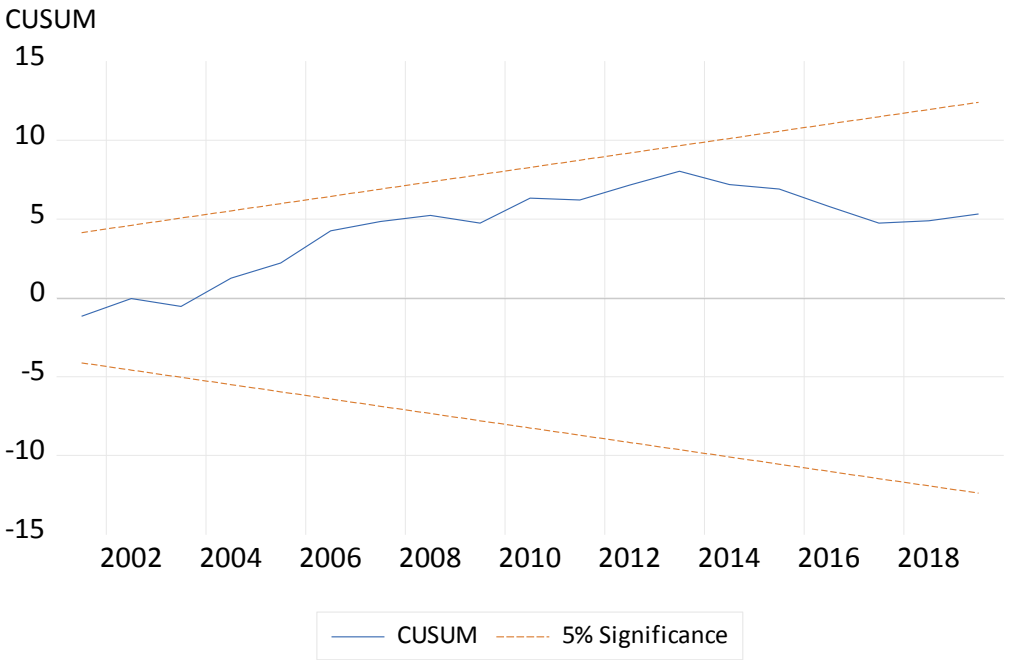
Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.173701	Prob. F(2,17)	0.8420
Obs*R-squared	0.720941	Prob. Chi-Square(2)	0.6973

Heteroscadescity

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.198633	Prob. F(16,19)	0.3495
Obs*R-squared	18.08399	Prob. Chi-Square(16)	0.3190
Scaled explained SS	4.656666	Prob. Chi-Square(16)	0.9972


CUSUM
15
10
5
0
-5
-10
-15
2002
2004
2006
2008
2010
2012
2014
2016
2018
CUSUM
5% Significance