

**INVESTIGATING THE DETERMINANTS OF SOVEREIGN BOND YIELD
SPREAD IN NAMIBIA**

A THESIS SUBMITTED IN PARTIAL FULFILMENT

OF

THE REQUIREMENTS

FOR

THE MASTER OF BUSINESS ADMINISTRATION FINANCE DEGREE

OF

UNIVERSITY OF NAMIBIA

BY

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OCTOBER 2020

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ABSTRACT

The study investigates the determinants of sovereign bond yield spread in Namibia for the period 2011 to 2019. Secondary quarterly time series data for the period 2011-2019 was used to investigate the determinants of government bond spread over the last decade. The variables used were ten-year government bond yield, GDP growth rate, government debt, current account balance and inflation rate. Data on all variables was obtained from the Bank of Namibia, except for the GDP growth rate which was obtained from the Namibia Statistics Agency. The tests employed included the unit root tests and the Autoregressive Distributed lag (ARDL) bound test. The study further performed diagnostic tests such as normality test, serial correlation, heteroscedasticity, Ramsey test, CUSUM and CUSUMSQ to test for the goodness of fit of the model. The results from the unit root tests with the use of the Augmented Dickey-Fuller test indicate that all variables were stationary at first difference except for the current account balance which was stationary at other levels. The bounds test to cointegration revealed that there is joint significance among variables, implying a long-run relationship. The ARDL model estimation results reveal that GDP growth rate and inflation rate have a positive and statistically significant effect on the sovereign bond yield spreads in the long run while in the short run GDP growth rate has a negative sign and inflation rate has a positive sign and both are statistically significant. The study also revealed also that government debt and current account balance have coefficients that are positive and negative, respectively. However, in both the short and long run, these variables are statistically insignificant, meaning they don't affect the sovereign bond yield spread. The findings also indicate the coefficient of determination of 87.7 per cent, meaning that there is a strong relationship and that the independent variables influence 87.7 per cent of the government bonds yield spread. Finally, the results of the diagnostic test confirm the long-run relationships between the variables and the stability of the coefficients.

TABLE OF CONTENTS

ABSTRACT	1
LIST OF TABLES	4
LIST OF FIGURES	5
ABBREVIATIONS	6
ACKNOWLEDGEMENTS	7
DEDICATION	9
DECLARATION	10
CHAPTER ONE	11
INTRODUCTION	11
1.1 Background to the study	11
1.2 Statement of the problem	16
1.3 Objectives of the study	17
1.4 Research Hypotheses	18
1.5 Significance of the study.....	19
1.6 Limitation of the study.....	19
1.7 Delimitations of the study.....	20
1.8 Summary.....	20
CHAPTER TWO	21
LITERATURE REVIEW	21
2.2 Theoretical Framework	21
2.1.1 Keynesian Framework	21
2.1.2 Bond spread.....	22
2.1.3 Measuring credit risk of government bonds.....	25
2.1.4 Measuring liquidity risks.....	26
2.1.5 Measuring Volatility risk.....	28
2.1.6 The Determinants of Sovereign bond spreads.....	29
2.1.7 Crowding – Out Effect	31
2.1.8 Framework of sovereign spreads.....	32

2.1.9 Empirical Literature Review	33
2.1.10 Summary of Literature Review	40
CHAPTER THREE	43
RESEARCH METHODOLOGY	44
3.1 Introduction	44
3.2 Research design.....	44
3.3 Data sources	45
3.4 Model specification.....	45
3.5 Data analysis	47
3.5.1 The long run model for sovereign bond yield spreads	50
3.5.2 The short run model estimates for sovereign bond yield spreads.	50
3.6. Research ethics.....	51
3.7. Summary	52
CHAPTER FOUR.....	53
RESULTS AND DISCUSSION	53
4.1 Introduction.....	53
4.2 Descriptive Statistics.....	53
4.3 Unit root test	55
4.4. Bound cointegration test.....	56
4.5 Long run results	57
4.6 Short run results.....	61
4.7 Diagnostic tests	62
4.8 Summary	64
CHAPTER FIVE.....	66
CONCLUSIONS AND RECOMMENDATIONS	66
5.1 Summary of the study and conclusions	66
5.2 Recommendations.....	68
5.3 Areas for Further research	69
6. REFERENCES.....	70
Appendix 1: Data Collected: 2011 to 2019	79
Appendix 2: Test results.....	81

LIST OF TABLES

Table 4.1 Descriptive statistics (2011-2019)	53
Table 4.2 Augmented Dickey-Fuller results	55
Table 4.3 Bound test results.....	56
Table 4.4 Estimate Long run model, ARDL (1 , 3 , 0 , 3 , 0)	57
Table 4.5 Short run results	61
Table 4.5: Diagnostic test.....	62

LIST OF FIGURES

Figure 1.1 Namibian government debts	14
Figure. 1a CUSUM	63
Figure 1b CUSUM of Squares	64
Figures 2. 1-5 Plot of time series	81

ABBREVIATIONS

ANOVA	Analysis of Variance
ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
BONAR	Bank of Namibia Annual Report
BON	Bank of Namibia
CUSUM	Cumulative Sum of Squares
DW	Durbin Watson
GDP	Gross Domestic Product
MOF	Ministry of Finance
NSA	Namibia Statistics Agency
OLS	Ordinary Least Square

ACKNOWLEDGEMENTS

First and foremost, I would like to thank the almighty God, my King and my Saviour for granting me physical health, finance and His grace to finish my research work. It is through his mercy and favour that this wonderful course was finished.

Secondly, I wish to thank my supervisor, Dr Reinhold Kamati, and Prof Emmanuel Ziramba for taking the time in guiding, reviewing and for the immeasurable support offered despite the busy schedule towards the research and finalising of this thesis. May the Almighty God continue to bless them with more knowledge and wisdom.

Thirdly I would also like to extend my heartfelt gratitude to my lovely girlfriend Johannes Helena Eunice and my children for all the love, trust and support and for the sacrifices they made for me, I remain indebted to them.

Fourthly, I give thanks to my beloved parents, my mother and my late father Mr Kamati Sindongo Sikongo Norman for giving me the support in pursuit of my education, for their inspiration, encouragement and their unending love. I also thank the management and staff of the Namibia Business School for the conducive learning environment they accorded me during my master's period, more especially to Jennifer Haihambo, Dr Greenfield Mwakipesile and Mr Arinze Okafor.

Finally, I would like to thank my classmates of 2018, Mr Arthur Mate, Ms Tiofilia Johannes, Mr Hendrick Nkole, Ms Tracy Simanga, Ms Luise Iileka, Ms Linea Ashipala, Ms Tuliky Shawapala, Mr Sakeus Mbango, Mr Johannes Katanga Iipinga and Mrs

Kledura Ipinge for moral aid throughout the academic journey. We have managed to overcome all tests and assignments presented to us, it was never easy at all, I thank you for the role played and to my friends and colleagues at CENORED, thank you for your support and encouragement, especially Ms Indileni Kamanya, Ms Precious Sasele and Mrs Rosalia Nanyeni.

DEDICATION

This research project is dedicated to my lovely girlfriend Helena Eunice, my children Ntando Petrus, Tity Loise and Joseph Uvhuke for the support they provided me during the entire period of the study.

DECLARATION

I, Valentinus Masonde Sindongo, hereby declares that this study is my own work and is a true reflection of my research and that this work or any part thereof has not been submitted for a degree to any other institution.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Government debt is when a country borrows money from another country or institution locally or from a foreign country to meet its obligations (Choong, Lau & Pua, 2010). Countries borrow funds with a different motive. To mention a few of the factors that contribute to borrowing: it could be to finance capital projects within the country such as building hospitals, improvement of road infrastructure, telecommunications, debt restructuring, servicing costs, to address a budget deficit and also for the political arena. Countries also borrow to stimulate economic performance in the local domestic market. However, several borrowings have brought a lot of side effects on many countries being indebted and not being able to free themselves from such debt.

The study aims at investigating the determinants of sovereign bond yield spread in Namibia issued quarterly from 2011 – 2019. This was the period in which the country experienced a drop in South African Customs Union (SACU) revenue and among others signalled macroeconomic overheating and growth in the sovereign bond yield spread.

The aim of conducting this specific research emanated from the fact that the bond yield spread of Namibian government and South Africa Benchmark bonds became wide according to the Bank of Namibia annual report of 2018 and the surge of government debts. Namibia has been issuing out a high yield of the same maturity bonds compared to the benchmark bonds. Mann (2001) defined the yield spread is the difference between the

yields on corporate bonds and comparable government bonds. Further on Avramov, Jostova, and Philipov (2007) revealed that changes in the spread are key inputs in the bond pricing. Besides changes in yield, spreads are building blocks of understanding the risk-return trade-off in government bonds and the management of credit risk. Yield spreads indicate market perception. That is, whether a sovereign bond must be charged more or less, therefore understanding the range is very much crucial as it sheds light on credit risks, default losses, tax and rises of sovereign debt level and cost of servicing the debts.

The growth of the debt level indicates that the sovereign debt will be charged more in the future. Furthermore, speculation on the ability to re-pay arises. For example, when the yield spread is higher, the cost of servicing the debt rises and thereby increasing financial risk and long-term debt sustainability. The increase in fiscal risk makes many investors demand a higher premium on any new government debt. According to Mu, Phelps, and Stotsky (2013) since 2011, USD 8.75 billion has been raised by countries such as Namibia and other respective countries in the global market. On the one hand, the participation of these countries in global capital markets has led to the deepening and enhancement of domestic capital markets. Therefore, this study seeks to identify factors that largely determine the spread of sovereign bonds in Namibia.

The results from this study will help the government craft fiscal policy that keeps the premium charged very low and reduce future debt servicing of government debts in the medium to long term. The rises of yield spreads in bond markets around the continent have resulted in many countries being indebted, and this is due to misappropriation of funds borrowed in such areas as the political funding arena, budget deficits and debt

restructuring, causing the yield spread to widen.

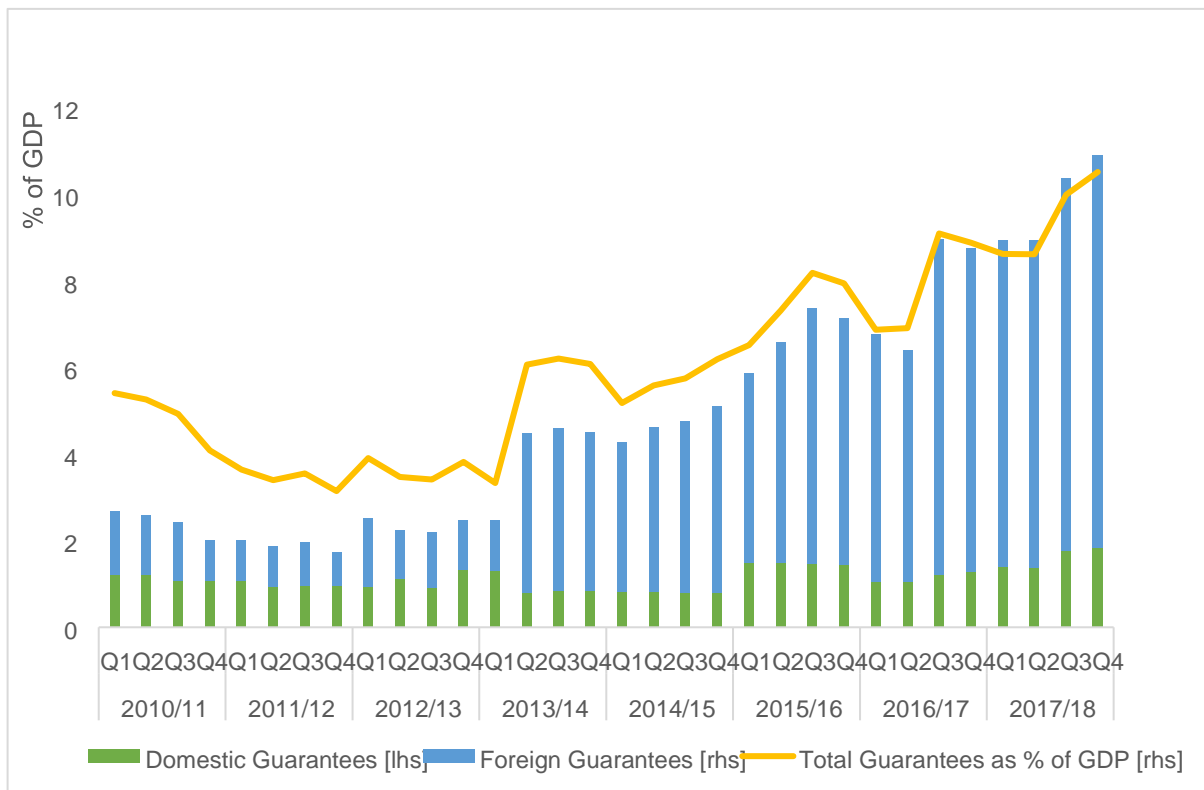
In this study, the researcher adds to previous literature by investigating the determinants of yield spread on sovereign bond by estimating time-series data. The stochastic is defined as a process that assumes that the underlying observed values will be explained by a constant parameters/ coefficient model. The linear regression models to be used will consider a continuous relationship between the explanatory variables and bond yield spreads. It also implies that the data modelled must satisfy the stationarity assumption.

The knowledge of these parameter values will enable the researcher to set up the confidence interval for the prediction of future observation value. Namibia, like any other developing country, faces a persistent increase in government expenditure as a growing concern according to the Bank of Namibia annual report (2018).

Figure 1.1, presents a growing trend observed in the government debts as a percentage of GDP. It is evident that more government debt being issued out is for funding of budget deficit, capital projects, debts restructuring and political motive. The alarming trends of government debt growing from 2013/2014 to 2017/2018 is disturbing. Namibia is a small economy with a population of approximately 2.5 million. However, the growth of government debt raises concern as it's not in line with the population size. The graph shows that government debt from the first quarter of 2010/2011 experience and downwards slope, this is mainly attributed to the booming of the economy in five years. Based on the booming of the economy, the government debt level reduced as more activity was occurring in the local domestic market. The study observed a normal borrowing country with smaller population size.

In the first quarter of 2013/2014, the government debt trend increased to double from just over 2.5 per cent of GDP. However, debt levels increased more than 9 per cent in 2015/2016 to 10.5 per cent in 2017/2018 respectively. The graph also shows that foreign debt has increased alarmingly compared to domestic debt. The widening of yield spread and the alarming rate of government debt were the main critical reason for this research.

Namibian government Guarantees



Source: Bank of Namibia (2018)

Figure 1.1 Namibian government debts

The rising public debt to support government expenditure has contributed to macroeconomic imbalance such as the widening of the current account deficit during the period 2011-2019. Added to this, the downgrade by the credit rating agency has also made

a significant impact on the yield spread. Since the dawn of independence in 1990, the government has maintained relative fiscal discipline and upheld macroeconomic stability and balance; such a stance has served the economy well. This budgetary management has improved the economic growth in employment and reduced the incidence of poverty and inequality.

Furthermore, unemployment, poverty and variation in Namibia remain a challenge. The government has, as a result, implemented and sustained different social safety net programs such as social grants to pensioners, disabled persons and vulnerable children and recently the introduction of a food bank and the introduction of free primary and secondary education in 2016. Moreover, the burden on government expenditure has increased the levels of debt in Namibia and resulted in high sovereign bonds spread.

The government has also increased spending in support of the country's development priorities and its long-term development vision, vision 2030, the National Development Plan, Targeted Intervention Program for Employment and Economic Growth and the Harambee Prosperity Plan. The growth in expenditure has not been meeting with the same level of growth in revenue collection, which ends up with the government borrowing to finance the budget deficit every year.

The primary budget deficit is a visible indicator of increasing fiscal fragility. Also, high internal registered stock of debt weakens public finance sustainability. It implies the burden on debt service payments and eventually a higher exposure to changes in yield

spread. These seem reflected in the widening of yield spread in the last decade. The overall state of the economy in Namibia is crucial in determining the country's ability to meet its payment obligations in the future.

1.2 Statement of the problem

According to the Deloitte Report (2019) over the five years from 2010-2014, Namibia went through the most substantial boom period with the most reliable and most sustained growth level seen since independence. However, the high growth rate, especially the post-global financial crisis, was associated with an increase in government debt. For example, between 2015 and 2017 public debt grew in nominal value from 56.4 billion Namibian dollars (37.6 % of GDP) to 72, 8 billion (40.3% of GDP). This represents an absolute increase of about 16.4 billion over three years. Furthermore, wider yield spreads on the sovereign bonds were observed compared to the preceding years and the South African benchmark bonds.

According to the Bank of Namibia Annual Report (2018) during this period, from 2015-2017, macro-economic conditions also deteriorated and the spread of government bonds widened too, highlighting substantial growing risks in the domestic economy. The government debt as a percentage of GDP rose beyond the government target of 35 per cent of GDP. Meanwhile, the fiscal deficit deteriorated further resulting in fiscal austerity for 2018 to 2019 financial year. The rise of 16.4 billion in debt level has placed undue pressure on the Namibian government's bond spread. As a result, going forward it will cost more to finance government deficit with a five or 10-year bond compared to a similar sovereign bond issued by the South Africa government, one can observe a mismatch in

aggregate demand and aggregate supply, resulting in a widening of the yield spread compared to the South African benchmark bonds, causing the yield spread to surge. According to the Bank of Namibia Annual Report (BONAR) for (2018), the yield spread on the Namibian sovereign bonds and South Africa benchmark bonds widened during 2015-2018. It implies the outside outcomes, for example, the government bond yield spread in GC20 against R207 average 113 basis points, roped from an average range of 165 basis points in 2017.

Further on the BONAR (2018) also states that the Namibian public debt burden stood at N\$86.6 billion at the end of December 2018, this represents an increase of 19.1% over the stock level registered in December 2017 domestic and external debt to finance the budget deficit. The evidence clearly shows that large deficits and debt level have a marked adverse impact on bond yield, and the magnitude of influence will contribute to the domestic and international factors. In the standard neoclassical model, fiscal deficits reduce national savings and increase aggregate demand (Elmendorf and Mankiw, 1998). Furthermore, it creates an increased supply of government debt, leading to a higher yield spread.

This study aims to examine factors that contribute to the determinants of yield spread on government bonds, and how yield spread influences the growth in new public debt. In particular: what seems to drive the yield spread in the Namibian government bonds?

1.3 Objectives of the study

The main objective of this study is to investigate the determinants of sovereign bond yield spread in Namibia since 2011. The main objective is made up of the following

specifics objective.

- To assess if there is a long-run relationship between government bond yield spread and its potential determinants.
- To examine if the GDP growth rate, Government debts, Current account balance and inflation rate are significant determinants of the sovereign bond yield spread.

1.4 Research Hypotheses

Based on the specific objectives outlined above, the study sought to test the following hypotheses.

H^1_0 : There is no long-run relationship between the government bond yield spreads and its potential determinants.

H^1_1 : There is a long-run relationship between the government bond yield spreads and its potential determinants

H^2_0 : The selected variables: Gross Domestic Product (GDP) growth rate, government debt, current account balance and the inflation rate are not a significant determinant of sovereign bond yield spreads.

H^2_1 : The selected variables: Gross Domestic Product (GDP) growth rate, government debt, current account balance and the inflation rate are a significant determinant of sovereign bond yield spreads.

1.5 Significance of the study

To the knowledge of the researcher, there has been no other study that tested the same variables in the context of government bonds in Namibia and it may, therefore, be interesting to examine which of the theories best explain yield spread determinants for government bonds in Namibia. It is the first study to investigate the quarterly yield spread determinant in a country that uses the inflation targeting framework with the market size and liquidity relatively lower compared to developed markets like South Africa.

The significance of the study is to test the systematic and idiosyncratic variable selected against the yield spread for the Namibian sovereign bonds. Furthermore, to analyse whether the chosen variables can improve the predictability of the yield spread by testing the importance of the selected variables on the Namibian sovereign bonds. Also, to examine what causes the yield spread to widen, or perhaps the primary focus can be a shift to other risk factors.

This is, as in Namibia little or no study has been conducted on the determinants of yield spread on sovereign bonds. The findings will also benefit the sovereign through the Ministry of Finance on policy formulation on how to improve the fiscal policy and their debt management strategies that relate to sovereign bonds.

1.6 Limitation of the study

The study was limited to data availability for the time series period taken on Namibia sovereign bond spread for 2009-2010, the Bank of Namibia could not provide historical data as far as 2009 and 2010, however, the study only obtained data from 2011 to 2019

for Ten 10-year government bonds issued, GDP growth rate, and sovereign debt as a percentage of GDP, current account balance as a percentage of GDP and inflation rate. Other limiting factors are data on some important variable for the study, the accessibility to data due to cost involved in extracting data on the web that requires vending services.

1.7 Delimitations of the study

The study focusses on Namibian sovereign bonds spread only, testing the 10-year bonds issued, Gross Domestic Product growth rate, sovereign debt as a percentage of GDP, current account balance as a percentage of GDP, and inflation rate. Adding another country would have increased the complexities of the study. A portion of the independent variables was used to test the spread in sovereign bonds. Other macro-economic factors were not part of the study.

1.8 Outline of the study

Chapter 1 introduced the idea behind what this thesis was all about. Chapter 2 provides a theoretical framework relating to the study in detail and presents findings of yield spread determinants from other researchers. Furthermore, the study presents the empirical results of the structural models. Chapter 3 describes and discusses the method used for analysing the research question. The hypothesis is tested and further on provides the procedure used to collect data used in econometrics in applying the estimation process. Chapter 4 presents the results and discussions from the empirical study. Chapter 5 concludes the research, presents recommendations and identifies areas for further study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The present chapter examines the existing literature review on the topic by various authors focusing on the determinants of the bond yield spread. The first subchapter looks at the theoretical framework and the second subchapter on the literature review from multiple authors, and the last subchapter provides a summary of the whole chapter.

2.2 Theoretical Framework

This theoretical section firstly examines the literature on critical factors influencing investors' decision making. The study begins by reviewing theories on the Keynesian framework, Bond spread, Measures on the credit risk of government bonds, Measures on Volatility risk and Measures on liquidity risk. Also, the Determinants of bond spread, the Relationship between sovereign debt and budget deficit, as well as the Crowding – Out Effect and presents the Conceptual Framework.

2.1.1 Keynesian Framework

Keynes (2007) argued that the central bank is the initial point and decision-making authority in the determination of the long-term rate of interest on government bonds. Understanding the central bank mechanism gives an overview of the formation. The author argued that the central bank plays a pivotal role in the yield of the government bond. Keynes (2007) further states that the government as a principal and central bank (agent) acts as a custodian on behalf of the government in investments. The author further states that the central bank formulates policies on how the short term and long-term

interest rate should be charged and the management of the macroeconomic status of the country. Regarding that, the theory further indicates that the government policy on issuing bonds is influenced by monetary policy. The government makes informed decisions on fiscal policy based on the monetary policy performance outcomes to influence yield on the bond borrowing. Keynes (2007) further argued that an investor looks at the long-term investment prosperity compared to the existing outlook, as investors lack concrete information in determining the future, however, the past and current information performance gear them to make informed decisions on an investment outcome.

The Keynesian point of view on the government bond yield is derived from the point that bond yield is attributed to budget deficits and government debt (Poghosyan, 2014). The Keynesian framework indicates that government bond yield is attributed to the central bank and liquidity preference which determines the rate of the interest rate. Akram & Das (2015) argued that the rate of interest on government bonds is determined by the central bank's decision on the inflation and interest rate charges.

2.1.2 Bond spread

According to Fabozzi (2012), bonds are a debt instrument requiring the issuer (also called the debtor or borrower) to re-pay to the lender/investors the amount borrowed plus interest over a specified period. It means that the borrower will pay attention to every period be it monthly or quarterly and the principal amount will only be re-paid at the end of the loan (Ross, Westerfield & Jordan, 2003).

Fabozzi (2012) asserted that a fundamental characteristic of a bond is that there is an inverse relationship between the price and yield. Moreover, this simply means that the cost of the bond is the present value of the cash flows. The inverse relationship between the rate and yield implies that when the yield increases, the current amount of cash flow decreases, the same applies, when the yield decreases the current amount of cash flow increases.

Fabozzi (2012) defined spread as the difference between the yield of similar maturity, for example, consider two bonds, Bond A and Bond B with the same maturity, the yield spread is the difference between yield charged on A and return charged on B. Generally, the yield spread reflects the difference in the risk's appetite associated with the two bonds and quoted in basis points. A basis point is identified as a unit of measure that describes the percentage change in the value of a bond or benchmark bonds. One basis point is equal or approximately equal to 0.01% (1/100th of a per cent) or 0.0001 in decimal form. The author further also asserted that the primary point is the change in the price of a bond for a one basis point in the bond yield, it can also be the price value of a basis point.

The bond yield spread is a bond risk that is determined by the credit risk, a chance that there will be default risk on the bond and risk appetite for example (Bellas, 2010; Beirne & Fratzscher, 2012). Suppose that investors are risk-averse, the relationship between risk-free and risky bond can be in this equation format as:

$$P(X_t)(1 + r_f) + (1 - P(X_t))(\mu) = (1 + r_g) + \sigma_t \gamma_t$$

Where, $P(X_t)$ is the probability of no default, $(1 - P(X_t))$ is the probability of default, r_f yield in a risky bond, r_g yield in a risk-free bond, μ recovery rate in case of default, σ_t risk aversion premium and γ_t liquidity premium.

Bond yield is the return that the investors expect to get from bond investment for their money invested, being in government bonds or corporate bonds. Investors always consider an essential aspect before they decide to invest in relationships, and one of the points is the amount of bond yield which they use as a measurement tool to know the annual rate of return. According to Fabozzi (2012), there are two terminologies in calculating yield: current yield and yield to maturity.

- a) Current yield relates to the annual coupon interest to the market price. The formula for the current yield is:

$$\text{Current yield} = \frac{\text{Annual Coupon payment}}{\text{Bond price}}$$

- b) Yield to Maturity (YTM) is the same as the yield (internal rate of return) in their computation; it is the expected rate of return for a bond assuming that the investor holds the asset until its maturity date.

$$p = \sum_{t=1}^n \left(\frac{C}{(1+y)^t} + \frac{M}{(1+y)^n} \right)$$

The symbols represent the following explanation:

C= Coupon

n = period to maturity (in a year)

R= redemption value

P = Purchasing value

2.1.3 Measuring credit risk of government bonds

Credit risk is the critical aspect that influences debt security prices and yield spread. Credit risks are a risk that controls the bond spread, and those risk factors have different explanatory power. Credit risk determines the creditworthiness of a particular entity that it would be able to comply with its obligation to pay off its debt, the probability that the government will not fall short in paying its debt. The rating agencies in their credit rating determines the creditworthiness of such entities/sovereign as well as investors with risk appetites, who demand a higher expected return as compensation for holding a bond. Credit risk can be measured by a different explanatory variable that explains the country's fiscal situation. For example, debt to GDP ratio, Deficit to GDP ratio, Credit rating, Current account balance to GDP ratio, real growth rate and competitiveness with the market, Political stability, the size of the banking sector with that particular country, inflation and default history.

Manase and Roubini (2005) argued that several factors contribute to the country's credit risk; hence, the rise in the yield. The increase in credit risk can associate with a rise in public debt ratio and gross financing needs. It could also associate with the falling in revenues and the projected weak economic growth in the medium term. Furthermore, it shows that macroeconomic fundamentals deteriorate compared to other countries when the bond spread widens up.

The authors further expressed that the lack of foreign receipts from international trade can also increase credit risk hence the sovereign Spread. When there is no openness to international deals, the output growth within the country decreases. International trade

also exposes exporters and importers to high risks; this is when the trading partner is far away or in the country where contracts are hard to enforce.

The country's international reserves pay the foreign currency debt. Therefore, an increase in export performance and foreign reserves plays an essential role in determining the sovereign Spread. When the foreign reserves are lower, the export revenues decrease too. That country can likely default on the external debt, thus increases sovereign bond spread (Manase & Roubini, 2005).

Government costs of servicing debt increases when there is weak economic growth within the country and this results in default. This forces the investor to demand a higher yield to compensate for the risk. Before any investment decision, investors mostly gather all information regarding the government bonds they wish to invest in. Furthermore, such information contains the past, present and future of the sovereign bonds. Investors also use expected future values regarding the credit risk in projecting the current bond value. Using expected benefits is common in many works of literature, but the lack of redundant data could be a challenge too. Credit rating agencies are also useful in explaining bond spread (Manase & Roubini, 2005).

2.1.4 Measuring liquidity risks

Liquidity is known to be playing an essential role in the financial market. For maturity yields of bonds denominated in the same currency can differ depending on the credit risk and liquidity risk of any two or more countries. The difference in those two sources of variation is very much essential, for example, from the policy perspective. For example, in 2015 -2018, the sovereign yield spread between Namibian and South Africa bonds

increased sharply and both countries share the same common monetary area. Liquidity postulates how easily an asset or security can be bought or sold in the market and one's ability to convert it into cash. The liquidity variable also relates to the country's ability to pay its short-term debt. Foreign reserves become more critical in determining the sovereign Spread. The country's international reserves pay foreign currency debt. Lower movement in exports leads to weaker foreign currency in most cases (Claessens, 2003).

Furthermore, liquidity tends to be inverse with the size of the market. In large markets of bonds, investors can trade quickly and face a lower risk that prices will change due to individual transactions and therefore, will demand less compensation in terms of the yield. Debt yields higher liquidity as it promises a better price for a bond when sold before maturity. Bid-ask spread for bonds are used to measure liquidity in the price dimension and is a feature of the market.

Favero (2007) asserted that smaller debt markets might play a role in bond spread by increasing them. Liquidity is defined to play an essential role in government bonds. The impact of credit risk can also associate with the suitability of the policy in place. For example, Ejsing, Grothe and Grothe (2012, p.3) stated that: "If spread widening is caused mainly by concerns about liquidity risk, this reflects mostly worries about the sustainability of fiscal positions, this would call for corrective economic policy measures". Favero and Missale (2012) and Bernoth and Erdogan (2010) also added that sovereign yield spread may be affected by liquidity risk. One of the risks could be of selling or buying an asset in an illiquid market at a low price, resulting in higher transaction costs.

2.1.5 Measuring Volatility risk.

Merton (1974)'s model, indicates that three proxies can determine the bond value and the yield spread of a sovereign bond: The return on risk-free debt, the bond's characteristic such as the maturity, coupon rate, and call terms. Furthermore, the probability of default will generally be led by the volatility of the stock market. Merton (1974) asserted that bondholders were viewed as risk-free holders who sold put option on the firm's asset to equity holders. According to Raider, Majoni, Njanike and Kwaramba (2016), the exercise price of the put option would be equal to the par value of debt.

The authors further indicated that the model specifies a continuous stochastic process for the value of a government bond, where the default is assumed to occur when the firm value falls below the par value of the outstanding debt. The authors further indicated the probability of the firm reaching the default threshold increase with an increase in equity volatility. High equity volatility on bondholders can be very dangerous as this raises the likelihood of default, which lets the bondholders demand higher yields to compensate for risk increase. It also implies that the yield spread can have a positive correlation with equity volatility (Campbell and Tasker, 2004). Risk aversion is the amount of compensation that investors require in buying a risky bond. When the risk bond yield leading to default probability is detected, the investor would expect to compensate for the indifference between the bonds. Risk aversion is used by VIX-index to measure the expected volatility in the U.S. stock markets for 30 days, and it is also used in actions such as the BBB-Spread and Bond spread. According to Schuknecht (2010), the BBB range was an essential factor in explaining euro countries' bond spreads. The author further asserted that without a rise in BBB-spread at the beginning of the crisis, Finland and

Germany's bond spread decreased as financial markets started to discriminate more based on the countries' fiscal fundamentals. McGuire (2013) further on moved for the use of BBB spread among other risk aversion measures. The author found risk aversion as a crucial factor in explaining the spread of 15 emerging economies.

Manganiello and Wolswijk (2009) also explained what causes risk aversion and found out that there is a positive relationship between short-term interest rates and bond spread. They suggested that this could be due to the risk aversion, for instance, in line with Rajan (2005) investment managers hedge when interest rates are low to improve their investment expected return. It explains that when the interest rate is higher, investment managers get enough returns with the investment that were bought earlier on, which they end up investing in a safe asset. The authors also explain that during economic turmoil, it could be that monetary policy is tighter due to the chaos in the economy and future expected return will be lower thus higher risk aversion.

2.1.6 The Determinants of Sovereign bond spreads

Several studies exist on economic, social, and political factors that determine the sovereign bond spread and creditworthiness. However, a number of these determinants cannot give a clear indication of the sovereign bond spread (Cantor & Packer, 1996). Some of the explanatory variables that are essential determinants are macroeconomic, liquidity and external shock variables.

GDP growth: When countries associate with a high economic growth rate, it implies that they have a strong financial position and lower sovereign spread. Real growth is the measure of the total of all outputs of goods and services occurring within a particular

country in a given period.

Current account: the current account deficit is a situation in which the country's gross saving is higher than the gross domestic product. It also asserts that a large consistent current account deficit leads mostly to the unsustainability of external debt. The country will not be able to pay up its foreign debt obligations.

Sovereign debt: investors use government debt as a percentage of GDP to measure the country's ability to make a payment on its debt. Thus, this affects the country's borrowing cost and sovereign bond spread. It is vital to note that investors are less likely to liquidate their securities when foreign investment is less attractive. It coincides with an increase in aggregate risk. When risk increases, investors demand liquidity abates and the premium they pledge on more liquidity securities decreases and vice versa. It also implies that investors' typical value liquidity is more; however, they value it less when the risk increases due to an inversed relationship in bonds.

Inflation rate: inflation is used as a measurement of government financial compliance. Political instability places a significant role when it comes to rising inflation and this results in a higher sovereign spread in bonds

The explanations above connect the yield spread and selected explanatory variables through investment and consumption. From the expectation hypothesis, the market participant's expectation about future interest rates informs the pricing of bonds, thus the prevailing yield spread. Investors prefer to maintain a uniform standard of living instead of high consumption during high levels of income and low consumption when income is low. It is also that if investors are expecting a recession, they will sell their short-term

investment and buy long term securities to ensure steady income in the future. As a result, the yield on short term securities will rise and those of long-term maturities will fall, thereby causing an inverted yield curve which associates with a slowdown in the level of economic activity and widens sovereign spread (Wheelock & Whoa, 2009).

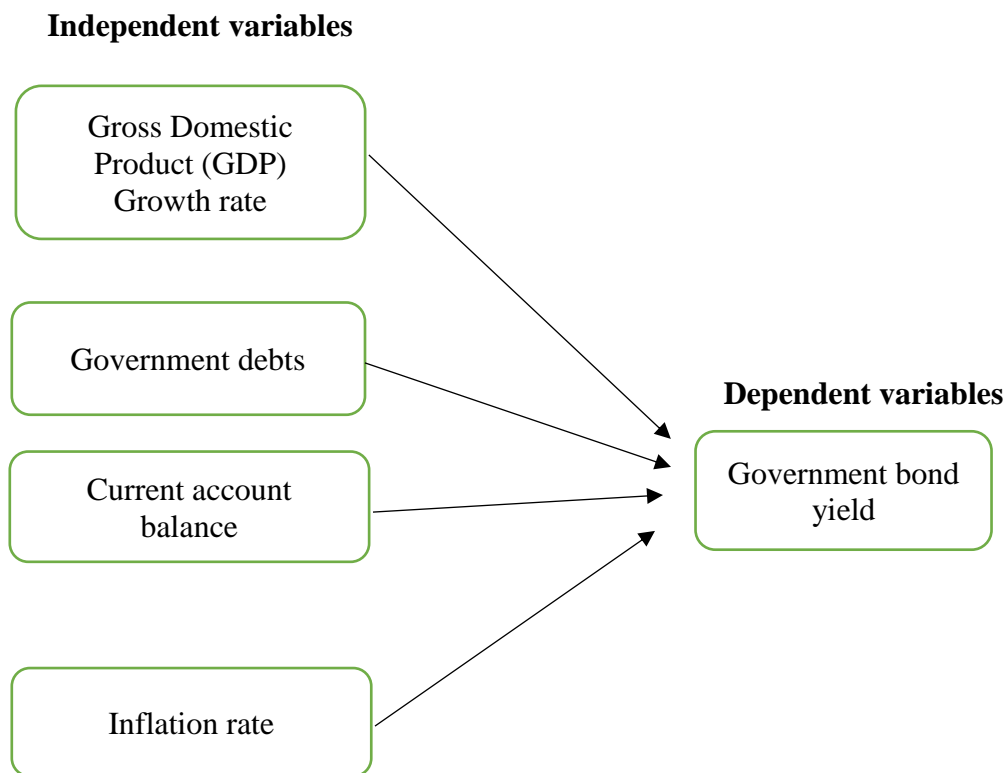
Lorenzo & Eric (2015) asserted that if the central bank undertakes contractionary monetary policy, the short-term rates will temporarily increase, and market participants will expect future short-term rates lower than the current level. As indicated in the expectation hypothesis theory, the long-term rates will increase more than the short-term rates, thereby causing an inverted yield spread, which is associated with the slowdown of economic activity. The Keynesian IS-LM model explained this more in detail and a graphical illustration of this argument, since tightening of the monetary policy shift the L.M. spread to the left increasing the low rates, thus contributes to a decline in the spread (Wheelock & Whoa, 2009).

2.1.7 Crowding – Out Effect

In theory, higher government bond yields spread is linked with an unstable fiscal position, for example, an enormous budgetary deficit. The unsafe situation correlates with an equilibrium rise in the interest rate, which results in more resources to spend. An unhealthy economic policy encourages more substantial inflationary pressure because of a more aggressive monetary policy, further on the rise in fiscal deficit contributes to an increase in the interest rate and for this reason increases the bond yield. These sentiments according to Gruber and Kamin (2010) express the compensation of the riskiness of the underlying asset, which a potential investor has to bear.

McConnel and Brue (1990) asserted that the idea behind the crowding-out effect is that, interest will be caused to increase due to deficits in the fiscal policy with a reduction in investment spending and weakening the stimulus of the budgetary plan. On the financial market, in financing government deficits, the demand for money increases the yield, which in the end increases the cost of borrowing money. Ahmed and Miller (2000) applied the fixed and random effects method in the case of some developed and developing countries. They established in the developing countries the expenditure by the government on transport and communication led to the crowding-out effect while spending on welfare and social security led to a decline in private investment.

2.1.8 Framework of sovereign spreads.



Source: Researcher's Construct (2019)

The framework of sovereign bond spreads illustrated above gives an indication of the relationship between the Independent variable and the dependent variable the researcher created. It is categorised into three dimensions as Control variables, dependent variable and independent variable. Econometrics Laboratory (1999), argued that parameters are divided into dependent and independent variables. Such variables are used to estimate the relationship between two variables as indicated above.

Dependent variables are a parameter that explains the variation of an independent variable; however, the dependent variable is the parameter that typically explains the usage of one or more explanatory variable and their correlation. Controllable variables are variables that can be measured depending on the independent variable, but all forms part of the independent variable.

According to Castree, Kitchin and Roger (2013), a dependent variable reflects the bond spread as the primary purpose of conducting the studies in predicting the bond spread and the ability to investigate how various explanatory variables affect the observed bond spread. The illustration above summarises the theoretical framework from different studies and this will assist the researcher in investigating the determinants of sovereign bond yield spread in Namibian.

2.1.9 Empirical Literature Review

Many authors have studied the determinants of yield spread on sovereign bonds. Manase and Roubini (2005) found out that several variables explain sovereign bonds spread. The authors classified them into three categories that depend on their merits, first being: "1. insolvency (high debt and high inflation); 2. Unable to pay, where the default is led by

large stocks of short-term liabilities relative to foreign reserves; 3 macro and exchange rate weaknesses" (Manase & Roubini, 2005, p.27).

Eichengreen and Moody (1998) examined the determinants of spread on emerging market debt. Their findings indicate that market sentiment does not connect to the fundamentals driving spread by a significant amount over a short time horizon.

Several studies indicate that interest rate differentials across EMU countries are very much affected by fiscal imbalances, due to the interest rate volatilities subjected to a default risk premium. Codogno (2003) examined the determinants of sovereign yield spread in the euro area with a sample of nine EMU countries: Italy and Spain. The author found out that the volatilities in yield differentials attribute to domestic fiscal fundamentals, Heppke-Falk and Heffner (2004) found that the expected deficit has a positive impact on yield spread in Germany, France, and Italy. According to Hallerberg and Wolff (2008), Bernoth (2006), and Gerlach (2010) interest differentials among E.U. countries vary depending on the debt and deficit levels of the issuing countries. Gomez-Puig (2008), found a similar result, showing that yield spread responds positively to a rise in obligations relative to Germany. Bernoth and Wolff (2008) focussed on the accuracy of officially reported fiscal variables and found that budgetary transparency and budget deficit levels have a significant impact on yield spreads.

Other studies have also shown that sovereign bond yield spread is driven not just by the country-specific risks factors but also by international factors and global investors' risk aversion too. Codogno (2003), Geyer (2004), Favero (2010) and Pozzi and Wolswijk (2008) found that yield spread across EMU countries is significantly affected by global

risk factors. Sgherri and Zoli (2009) and Manganeli and Wolswijk (2009) also found out that a substantial part of EMU yield spread explains the common international factor that reflects the investor's risk aversion. With uncertainty sometimes, investors become more risk-averse and restructure portfolios. Flight to safety favours bonds of countries that are generally at a low default risk level.

Collin, Dufresne, Goldstein, and Martin (2001) also assert that changes in yield spreads determine the returns of hedge fund managers who take a highly levered long position in corporate bonds combined with a short post to hedge against interest rate risk. The yield spread usually is to be driven primarily by expected default losses, tax and the risk premium on corporate bonds (Mann, 2001). Moreover, a study by Merton (1974) has shown that other proxies play a pivotal role in yield spread determination.

In Merton (1974)'s model, one of the determinants of bond yields is the probability of default as indicated by the equity volatility on the stock market. Jubinski and Lipton (2012), Hibbert (2011), Campbell and Tasker (2004), Kwan (1996) reported evidence in support of Merton (1974)'s hypothesis. They recorded a positive relationship between equity volatility and bonds yield spreads for a sample of bonds listed in the united stated of America (USA). Several studies, as indicated above, also showed that other factors drive yield spread changes in addition to the expected default, tax and risk premium.

Furthermore, of significance was that those studies were conducted before the financial crises of 2007-2008 except for Hibbert (2011). Thus, relatively little research investigated how the other factors affected the impact of these yield spread determinants. In addition to that, the majority of studies focused on developed markets (e.g. Jubinski & Lipton 2012;

Hibbert, 2011; Lepone and Wong, 2009; Campbell and Tasker 2000; Kwan 1996) mainly the USA and Euro markets while fewer studies were conducted in emerging markets within Sub-Saharan Africa.

Bernoth, Kerstin, Erdogan, and Burcu (2010, p.3), asserted that Liquidity risk premium also plays an essential role in the determination of the yield spread. The authors further stated that it is necessary to extract the liquidity component from yield spreads because it might signal a lack of financial market integration rather than discrepancies in fiscal positions. Further on, in the theory of liquidity premium, illiquidity is priced by financial markets owing to the trading costs it creates. Other studies have also shown evidence that there is a mixed bond yield existence in the liquidity premium. Gomez-Puig (2006), Barrios (2009) and Gerlach (2010) confirm that a liquidity risk premium is a significant element of euro area bond yield spreads.

Favero (2010) showed that liquidity risk is priced only in a subset of the euro area bond market, while Beber (2009) found evidence that liquidity matters only in times of heightened market stress. Codogno (2003) also stated that liquidity differences appear to play at most a minor direct role; evidence can also be confirmed by Pagano and Von Thadden (2004)'s studies. The authors further added that liquidity plays a more significant role through the interaction with changes in absolute risk. Geyer (2004) and Bernoth (2006)'s findings could not have a substantial liquidity effect on yield differential across EMU countries.

Yieand and Chen (2019) investigated the determinant of sovereign bond yield in Malaysia from the time series spanning from 2006 to 2016. The potential variables tests were the interest rate, GDP growth rate, exchange rate and current account balance as a percentage

of GDP. Their study finds reveals that current account balance is the determinant of government bond yield. Their study used the Autoregressive Distributed lag (ARDL) model for estimation.

Gibson, Heather – Hall, Stephan – Tavlas, George (2012) argued that determinants of the bond spreads are studied using time series co-integration techniques such as VAR, and their finds indicate that long-term fiscal fundamentals that affect the spread. Nickel (2009) and Frenkel (2001) also found that a higher budget deficit in Sweden leads to higher government borrowing cost. They examined economies by using multiple regression. In Namibia to date, there are limited or no studies conducted in investigating the Namibian sovereign bonds.

Gibson (2011) explained the reasons which led to the financial crisis in Greece in 2009. The author's interest was in the connection between growing fiscal imbalances and bond spreads. The author used two main empirical approaches to investigate the determinants of bond spread. First, the author studied the bond risk premium by breaking it into credit rating and irrational and described the distinctive factors of the markets. Credit rating is known to tell the strong fiscal fundamentals on the ridiculous part of the risk premium in the market based on the under-pricing or overpricing of the bond sign. Secondly, they investigated Greek bonds spread relative to Germany's 10-year bond by using the monthly data from the period 2000-2010.

Gemmill and Keswani (2011) ran panel data using a regression model, and they found that yield spread can be defined by idiosyncratic risk proxy as the systematic risks proxy has less association with the yield spread. Furthermore, they found that idiosyncratic bond

yield volatility has an impact on the yield spread than other firm-specific factors because bond yield volatility reflects the distribution of the firm's value, and it can be an indicator of liquidity. Furthermore, the authors also stated that equity volatility is significant in predicting future yield spread. According to the research, Gemmill and Keswani (2011) worked with a broad data sample from 1997-2004. Moreover, one of the reasons was to observe better variables that were of economic necessity among statistically significant variables, since all variables were statistically significant, but less was of economic importance.

Campbell and Tasker (2003) conducted a similar study where a robust positive relationship between the yield spread and the firm's equity volatility was observed. However, the only primary issue that distinguished the observation results is that the results provided by Campbell and Tasker (2003) were higher than the results obtained from Gemmill and Keswani (2011). Due to the inconsistency observed between the volatility and yield spread, Campbell and Tasker (2003) rejected the structural model of yield spread while Gemmill and Keswani (2011) accepted its importance and emphasised its contribution to explaining the yield spread further.

The empirical investigation of government bond spread goes back to Edwards (1984), who initially linked the sovereign spreads to market perception of a country's risk of default. The author also asserted that sovereign yield spread could interpret the local domestic as well as global macroeconomic, fiscal and financial variables which form the main investor concern of examining countries' investment creditworthiness.

The identification of short- and long-term determinants of sovereign bond spreads with a dynamic error correction model (examples include Dell' Aricia, Goedde, and Zettelmeyer 2000; Ferrucci 2003; and Goldman Sachs 2000). Ferrucci (2003) concludes that markets take into account macroeconomic fundamentals when pricing sovereign risk. The external debt to GDP ratio, the degree of openness, the ratio of amortizations to reserves, and the ratio of the current account to GDP are all significantly correlated with sovereign spreads; the interest payments to external debt ratio and the fraction of short-term external debt are also correlated with sovereign spreads, albeit weaker. Ferrucci also finds that nonfundamental factors play an important role, as suggested by the strong empirical relationship between sovereign spreads and external factors such as global liquidity conditions and U.S. equity prices

Dbouk and Kryzanowski (2010) studied using ex-ante to determine the estimation in their analysis and learnt that expected values of GDP and inflation seem to be better determinants of yield spread than ex-post values. Furthermore, the study applied the regression Ordinary Least Squares (OLS) technique to find out how interest rate spread influences the success or failure of the banking sector. The author's results indicate that macroeconomics was the main cause of the interest rate spread. In earlier studies, Samahiya and Kaakunga (2014) conducted a study on the determinants of commercial banks interest rate spreads in Namibia by using panel data at the bank-level. In the study, they applied the OLS technique to observe bank-specific variables that influence the interest rate spread in Namibia over a specific period from 2004: Q1 to Q4. In their results, they were able to find factors such as inflation rate influence the interest rate spread.

Gibson (2011) stated that the determinants of bond spread were best studied using time series co-integration techniques such as ARDL and the importance of using that technique is to find out the long-term fiscal fundamentals that influence the spread. Moreover, this indicates that after the author has studied, they estimated the co-integration relationship between the macroeconomic determinants and country spread. They compared the estimates to the actual values. Costantini, Frassetto and Melina (2013) in their study of the determinants of government bond spread applied the panel co-integration method and their findings revealed that fiscal imbalance and liquidity conditions were the main long-run determinants of government bond yield.

2.1.10 Summary of Literature Review

The study adopted the Keynesian framework. It provided a theoretical basis on which the study opted to investigate the determinants of government bond yield spread in Namibia. The literature discussed the Keynesian framework, bond spread and measurement of credit, liquidity and volatility risks, crowding out effect and sovereign bond framework. The Keynesian framework glanced at the interest rate and inflation rate influence by the central bank decisions, the bond spread at the basic principle of bonds and the measurement formed the basis on which the study sought to find advice on what determines the government bond yield spread in Namibia.

Based on the literature reviewed, it avails that several studies investigated the determinants of sovereign bond spread across the globe especially in the euro area and U.S bond markets. Manasse and Roubini (2005) investigated the determinant of sovereign bond yield spread. Their findings indicate that factors such as Insolvency – high debts and high inflation rate, the ability of not being able to pay its debt and the weakness of

macroeconomic and exchange rate explains the yield spread on sovereign bond. Edward (1984) investigated the sovereign bond yield spread. His study results revealed that the market perception of a country's risk of default and local domestic and global macroeconomic, fiscal fundamental were the main determinant of the sovereign bond yield spread.

Codogno (2003) also found that fiscal fundamental was the determinant of the sovereign bond yield spread. Falk and Heffner (2004), Hallerberg and Wolff (2008), Bernoth (2006) and Gerlach (2010) results indicate that sovereign bond yield spread depends on the country's very debt and deficit level of the issuing country. Gomez-Puig (2008) found similar sentiment in his study. Geyer (2004), Favero (2010) and Pozzi and Wolswijk (2008) investigated the determinant of sovereign bond yield spread across the EMU countries. Their findings indicated that the global risks factor was the influence of the sovereign bond yield. Their study is supported by Manganeli and Wolswijk (2009), Gibson, Heather-Hall, Stephan-Tavlas, George (2012) and Nickel (2009) and Frenkel (2001).

Dbouk and Kryzanowski (2010) examined the sovereign bond yield spread and applied the Ordinary Least Square (OLS) technique, to find out how interest rate spread to influence the success or failure of the banking sector. The study result indicates that macroeconomics was the main cause of the interest rate spread. Gibson (2009) examined the financial crisis in Greece in 2009, with the main issue of interest rates connection between the fiscal imbalance and bond spread. The finding from Gibson's study exhibit that bond spread is determined strongly by the fiscal fundamental on the risk premium in the Market base under-pricing or overpricing of the bond sign. Gibson (2011) examined

the sovereign bond yield in long run, using time series cointegration technique such as the ARDL model, the study findings revealed that fiscal fundamental were the influence of sovereign bond yield spread.

Similarly, the study is supported by Costantini, Fragetta and Melina (2013). According to the empirical review on the determinant of sovereign bond yield spread it indicates that many factors influence the yield spread depending on the specific country or regions at a certain horizon in time. It demonstrates that no means will settle the debate about the stability and significance of the sovereign bond spread, as it all depends from country to country.

However, this literature review was not tested in the context of government bond spread in Namibia. Only three studies were conducted on the determinants of interest spread in Namibia in the Banking sector, the earliest study being in 2012, the second in 2014 and the latest research was done in 2016.

The literature indicates that various factors influence the determinants of sovereign bond spread. I.e. the Political factors, international factors and macroeconomic factors. Based on the empirical review the study selection of variables was supported by Cantors and Packer (1996) and Edwards (1984). Furthermore, the researcher is interested in investigating the fundamental drivers that determine the sovereign bond spread in Namibia. All the materials listed above-shed light on what variables might contribute to the sovereign bond spread being investigated.

To the researcher's knowledge, little or no research has been conducted in Namibia on the determinants of sovereign bond spread, apart from the three studies that so far investigated

the determinants of interest rate on the Banking sector. Therefore, this research looked at contributing to other researchers work on the debate of the determinant of sovereign bond yield spread, looking at sovereign bond yield spread at Namibian level. The next chapter presents the methodology that was applied in carrying out the research.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter introduces the practical procedures and techniques used to estimate the determinants of government bond yield spread in Namibia. The study employed an Autoregressive Distributed Lag (ARDL) econometric model. An autoregressive distributed lag (ARDL) model is based on a model which is applicable for integrated of order one and order zero series or a combination of the two. The study used the ARDL model to achieve its objectives.

3.2 Research design

The study adopted a quantitative research approach that used secondary data, to determine the relationship and interpret the findings of the selected explanatory variables on the government bond yield spread. The aim of using quantitative time-series data was to determine the influence of selected explanatory variables on government bond yield spread. Creswell (2014) argued that the quantitative research approach allows the testing of various theories by conducting a study where the main objective is to investigate the relationship between selected variables. Bax (2013) added that a quantitative research approach is aimed at mainly collecting secondary data that is statistically tested.

The quarterly time-series data used runs from 2011Q1 to 2019Q4 and the data was obtained from the Bank of Namibia (BON) and Namibia Statistics Agency (NSA). The econometric statistical package, EViews (version 10) was used to process the time series

data. Descriptive statistics and simple linear regression model were adopted to determine the relationship between the selected explanatory variables which were (Gross Domestic Product growth rate, government debt, and current account and Inflation rate). The Augmented Dickey-Fuller (ADF), Co-integration test and Autoregressive distributed lags were used to determine the long run and short-run relationships.

In the literature reviewed in Chapter 2, several studies investigated the determinants of sovereign yield spread in different countries, especially the euro area and the U.S bond market and less were in the emerging developing countries such as in Sub-Saharan Africa. The study looked at the critical drivers of sovereign bond spread in Namibia. There were limited studies conducted in Africa, especially in Namibia where little or no studies have investigated the determinants of sovereign bond spread. The study will further contribute to expanding the research by testing the significance of the explanatory variables selected.

3.3 Data sources

The study used secondary quarterly time series data with the sample period from 2011 Q1 – 2019 Q4 consisting of 36 observations. The study collected data from the Bank of Namibia (BON) and the Namibia Statistics Agency (NSA). Data collected from (BON) comprised of Ten-year government bonds yield, government debt, current account balance, and inflation rate. Data collected from (NSA) comprised of information on the Gross Domestic Product (GDP) growth rate. The data obtained from the Bank of Namibia and Namibia Statistic Agency were in quarterly form.

3.4 Model specification

For the study to investigate the determinant of the sovereign bond yield spread. The study used Edwards (1985) empirical common practice model. The model is an inter-temporal

which is used to construct the determinant of sovereign bond yield spread in Namibia. It is a general inter-temporal optimizing equilibrium model used in the emerging bond market where tradeable and non-tradeable can be exercised. The model differentiates proxies that determine the equilibrium sovereign bond spread in the long run from those that determine the short-run dynamics of the sovereign bond spread in many emerging market bonds, unlike other models, however, due to lack of availability of certain data, certain variables were not included and the study did not explore all variables used in Edward's model. The study used a single variables empirical model, the Ten-year government bond yield spread is the endogenous variable, while the Gross Domestic Product growth rate, Government debts, Current Account balance and inflation rate are treated as exogenous variables in the model. The empirical model for sovereign bond yield spread is represented in the equation as follows.

$$Spread_t = (Growthr_t, Debtgdp_t, CA_t, Inf_t) \dots \dots \dots (Eq.1)$$

Where:

Spread is Ten-year sovereign bond yield

Growthr is Gross Domestic Product growth rate

Debtgdp is government debt as a percentage of GDP

CA is current account balance as a percentage of GDP

Inf is the inflation rate

For the study objective to be achieved, a long run multivariate time series statistical model was constructed to analyse the variables shown as follows.

$$\text{Spread}_t = \beta_0 + \beta_1 \text{Growth}_t + \beta_2 \text{DebtGDP}_t + \beta_3 \text{CA}_t + \beta_4 \text{Inf}_t + \varepsilon_t \dots \dots \dots (\text{Eq.2})$$

Where:

β_0 Denote constant, $\beta_1, \beta_2, \beta_3, \beta_4 \dots \dots \dots$ denotes marginal effects of potential variables, ε denotes the error term, t and denotes Time. Based on the empirical literature review, the effect of GDP growth rate on the sovereign bond yield spread is expected to be negative, government debt is expected to be positive, the current account balance is expected to be negative and the inflation rate is expected to be positive.

3.5 Data analysis

The study used 36 observations to determine how the selected explanatory variable influence the government bond yield spread in Namibia. The econometric analysis was performed using the EViews (version 10) econometric software package to test the estimations. The study performed a diagnostic test to ascertain the accuracy of the empirical model. The diagnostic test determines that all estimated coefficients are statistically significant based on the t and F tests and that they have correct signs Gujarati (2003). The diagnostic test ensures that the assumption criteria under classical linear regression model are met Picket, Reilley and McIntyre (2005), this is done by checking the stochastic properties in the estimated model.

Time series data for a regression model is required to meet a certain standard that assumes asymptotic analysis is valid and that the t statistic follows a distribution that ensures that the hypotheses testing of the regression parameters is valid. There are several statistical tools used to conduct the unit-roots test of a dataset. These include the “Augmented Dickey fuller test”, “Phillips and Perron test”, Kwiatkowski –Phillips-Schmidt- Shin test”

and “Ng and Perron test”. The study adopted the Augmented Dickey-Fuller (ADF) test to test the stationarity in dataset. Augmented Dickey-Fuller is a unit root test and it is one of the best known and the most used tools to measure the stationarity and levels of integration in variables (Dickey & Fuller, 1979). It is the unit root test based on the model of the first-order autoregressive process Box & Jenkins (1979).

The study conducted the Augmented Dickey-Fuller test to examine the stationarity of the time series data for the following variables; Ten-year government bond Yield spreads, GDP growth rate, government debt, current account balance and inflation rate. The unit root test is a compulsory test that needs to be tested in time series data before model estimations. This is important to avoid spurious regressions. ADF is one of the tests conducted first before the Autoregressive Distributed Lagged model is performed. The ADF serves as the filter in purifying the time series data examined in the study for non-stationarity. This justifies a clear picture of the times series data being observed (Diebold and Kilian, 2000). If the variable is found to be stationary at levels are said to be integrated of order zero, $I(0)$ and if variables are stationary at first difference are said to be integrated of order one, $I(1)$.

The co-integration for bound test approach by Pesaran, Shin and Smith (2001) was adopted to test for the existence of the long-run and short-run dynamic relationship of the variables and the ARDL model approach equation was employed to determine the estimation of the parameters in the equation. The study preferred the ARDL model over other model specifications due to several advantages. Firstly, the ARDL model works well with a small sample as in the case of this study only have 36 observations. Secondly, it is a flexible model with the mixed order of integration associated with economic variables.

Thirdly, a dynamic unrestricted error model (UECM) can be derived from the ARDL bound testing through a simple linear regression. Lastly, the UECM integrates the short-run dynamics with the long-run equilibrium without losing any information for the long run.

The bound test approach to co-integration involves the following error correction model

$$\begin{aligned} \Delta Spread = & \beta_0 + \sum_{i=1}^n \gamma_i \Delta Spread_{t-i} + \sum_{i=0}^n a_i \Delta Growth_{t-i} + \sum_{i=0}^n \delta_i \Delta Debtgdp_{t-i} \\ & + \sum_{i=0}^n c_i \Delta CA_{t-i} + \sum_{i=0}^n d_i \Delta inf_{t-i} + \beta_1 spread_{t-1} + \beta_2 Growth_{t-1} \\ & + \beta_3 Debtgdp_{t-1} + \beta_4 CA_{t-1} + \beta_5 inf_{t-1} + \varepsilon_t \end{aligned}$$

.....Eq.3

Where β_0 represents the intercept, and a_i are the short-run parameters, β_i are the long-run coefficients and Δ is first difference operator while ε_t represents residuals. The null hypothesis of no cointegration and alternative hypothesis are tested as follows:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

The null hypothesis implies that there is no cointegration and alternative hypothesis implies that there is cointegration and which indicates that equation 3 above have a long-run relationship. The ARDL cointegration technique identifies the long-run relationship

among variables in the model. The technique uses are the Wald or F statistic to test the joint significance of $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 . The study adopted the used of the F-statistic bound test approach to test the joint significance cointegration. The bound test approach by Pesaran, Shin and Smith (2001) indicates that the F-statistic must be larger than the upper bound value for the variables to be cointegrated. It implies in another word that to reject the null hypothesis of no cointegration, the calculated F-statistic must be greater than the upper bound. After the cointegration bound test is done, the next step is to estimate the long run and short run models to determine the effects the explanatory variables on the dependent variable.

3.5.1 The long run model for sovereign bond yield spreads

The long run model of sovereign bond yield spread is constructed by selecting the lag order of the ARDL model using the lag length selection criteria of the Akaike Information Criterion (AIC).

The model equation is presented as follows:

$$\begin{aligned}
 Spread = \beta_0 + \sum_{i=1}^n a_i Spread_{t-i} + \sum_{i=0}^n b Growth_{t-i} + \sum_{i=0}^n c_i debtgdp_{t-i} \\
 + \sum_{i=0}^n d_i CA_{t-i} + \sum_{i=0}^n e_i inf_{t-i} + \varepsilon_t
 \end{aligned}$$

..... Eq.4

3.5.2 The short run model estimates for sovereign bond yield spreads.

The short run dynamic is estimated by the error correction model (ECM) to determine

how the disequilibrium in the past is corrected in the current period.

$$\Delta Spread = \beta_0 + \sum_{i=1}^n \alpha_i \Delta Spread_{t-i} + \sum_{i=0}^n \partial_i \Delta Growth_{t-1} + \sum_{i=0}^n \delta_i \Delta debtgdp_{t-1} + \sum_{i=0}^n \vartheta_i \Delta CA_{t-1} + \sum_{i=0}^n \rho_i \Delta inf_{t-1} + \phi ECM_{t-1} + \varepsilon_t$$

.....Eq.5

Where β_0 represents the drift component, and $\alpha, \partial, \delta, \vartheta, \rho$ are the short run parameters dynamic and ϕ is the speed of adjustment while ε_t represents residuals. The study conducted diagnostic test to examine the normality, serial correlation and heteroscedasticity in the ARDL model to determine the goodness fit of the model. The Stability test was also conducted from the parameter model to ensure that there is no misspecification in the model (Narayan & Narayan, 2006). The stability of the parameter was tested using the Ramsey RESET test, Cumulative Sum of recursive residual (CUSUM) and Cumulative sum of Square (CUSUMSQ) test.

3.6. Research ethics

The researcher treated all secondary information collected from the Bank of Namibia and the Namibia Statistics Agency as confidential and information obtained was only meant for the research purpose. Plagiarism was avoided, and the work of other scholars was always acknowledged.

3.7. Summary

For any research project to be authentic and achieve its objectives, the methodology must be clearly outlined, it must indicate the steps of the research work and technique used to

address issues and to produce good results that fit the objectives of the research and that support decision-making. The study adopted autoregressive distributed lag to investigate the determinants of sovereign bond yield spread in Namibia. The potential determinants investigated in the study are the Gross Domestic Product growth rate as obtained from the Namibia Statistics Agency. Government debt, current account balance and inflation rate over the ten-year period and government bond yield were obtained from the Bank of Namibia, in their secondary quarterly form.

The study suggested those determinants in support of the literature review from different authors to investigate what influence they have on sovereign bond yield spread in Namibia. Before any investigation, the study used descriptive statistics to determine distributions in the data. The Augmented Dickey Fuller test was used as the tool to test time series quarterly data for stationarity and the bound cointegration test was used to determine the existence of long run and short run dynamic relationships between the variables. The study also conducted diagnostic tests to examine the normality, serial correlation and heteroscedasticity in the ARDL model to determine the goodness of fit of the model. The next chapter presents the results of the study and their discussion with the literature in mind.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the empirical estimation of the study results and a discussion to come up with the findings. The chapter presents the results from the EViews (version 10) econometric package model used in facilitating the whole estimation process using Descriptive statistics, diagnostic tests and Autoregressive distributed lag (ARDL) models. The main objective of the study was to determine the influence of selected explanatory variables such as Gross Domestic Product (GDP) growth rate, government debt, current account balance and inflation rate on government bond yield spread in Namibia and their long run relationship. Section 4.2 presents an analysis of the descriptive statistics. Section 4.3 presents the findings of the unit roots tests. Section 4.4 the Bound cointegration test, Section 4.5 and Section 4.6, respectively, Long run and Short run coefficient results and lastly section 4.7 presents a summary of the results.

4.2 Descriptive Statistics

	Yield Spread	GDP growth rate	Government debt	Current account balance	Inflation rate
Mean	0.89	2.85	34.37	-8.16	5.23
Median	0.90	2.41	33.25	-6.60	5.23
Maximum	1.17	13.70	56.80	0.93	7.70
Minimum	0.51	-4.30	16.70	-21.66	2.70
Std. Dev.	0.16	4.64	11.29	6.00	1.36
Skewness	-0.06	0.42	0.27	-0.51	-0.12
Kurtosis	2.79	2.35	1.71	2.41	1.97
-Bera	0.09	1.71	2.94	2.06	1.67
Probability	0.96	0.43	0.23	0.36	0.43
Sum	32.16	102.77	1237.40	-293.61	188.14
Sum Sq. Dev.	0.92	753.80	4463.27	1261.51	65.09
Observations	36	36	36	36	36

Table 4.1 Descriptive statistics (2011-2019)

Table 4.1 presents the descriptive statistics summary characteristics of the results from the data analysis performed in an assessment of five groups of variables: yield spread, GDP growth rate, government debt, current account balance and inflation rate for quarterly results for the nine years spanning from 2011 to 2019, making up a total number of 36 observations. In addition to that, the normality of data is defined by the Jarque-Bera statistic test taking into account the skewness and Kurtosis. Descriptive statistics is performed in determining the distribution of the data and to account for the mean, median, standard deviation respectively before the econometric analysis is performed.

Table 4.1 indicates that for the past nine years averaged quarterly government yield spread has a maximum of 1.17% and a minimum of 0.51%. The variation over the nine-year period with 0.89% and 0.16% as the mean and standard deviation. The GDP growth rate shows a steady increase with a minimum value of -4.30% while the maximum value is 13.70%. Government debt shows the highest mean of 34.37% among all variables, with a maximum value of 56.80% and minimum of 16.70%. The current account balance has a maximum of 0.93% and a minimum of -21.66% among all variables and the inflation rate has a maximum of 7.70% and a minimum of 2.70%. All the distributed variables are fairly symmetric around the mean, only current account balance and inflation rate show a skewed long left tail, with a lower percentage value.

The Jarque–Bera test for yield spread reported in table 1 showing a probability of 0.96 per cent is greater than the critical value of 0.05 per cent indicating that the null hypothesis can be rejected. The rule of thumb implies that if the Jarque-Bera statistic has a probability greater than the critical value, the null hypothesis is rejected and vice versa for example in Yield spread ($0.96 > 0.05$) indicates that the variable is normally distributed. The results

imply that the other remaining variables reported in table 1 are also normally distributed fairly to moderate and close to mesokurtic.

4.3 Unit root test

The study examined the time series properties of the data first, to determine that the variables are not integrated of order two (I (2)) which gives the spurious result. This is done first before any test for cointegration relationship between sovereign bond yield spread and its determinants are performed. The bound test for ARDL assumes that all variables should be integrated of order zero or integrated of order one, as the presence of integration of order two violates the ARDL model assumption. Quashara (2004) asserted that the F-statistic provided by Pesaran *et al.*, (2001) are not valid for the integration of order two I (2).

Table 4.2 Augmented Dickey-Fuller Test results

Augmented Dickey-Fuller (ADF)					
Variables	Individual intercept		Individual intercept and Trend		Order of integration
	Level	1 st difference	Level	1 st difference	
Spread	-2.011 (2.614)	-1.945 (3.205)	-5.638*** (3.639)	-5.869*** (4.253)	I(1)
Growthr	-1.278 (2.619)	-2.643 (3.222)	-5.817*** (3.662)	-5.639*** (4.285)	I(1)
Debtgdp	-0.023 (2.613)	-2.041 (3.207)	-5.185*** (3.639)	-5.180*** (4.253)	I(1)
CA	-3.670*** (3.633)	-3.770*** (3.544)	-	-	I(0)
Inf	-2.089 (2.614)	-2.480 (3.207)	-4.831*** (3.639)	-4.839*** (4.253)	I(1)

Note: The *** denotes the rejection of the null hypothesis at 1% level of significance,

Table 4.2 above demonstrates the outcome results for the Augmented Dickey-Fuller test. The ADF null hypothesis is that the variables are non-stationary. The results in Table 4.2 indicate that variables: government bond yield spread, GDP growth rate, Government debt and inflation rate were nonstationary in levels as the null hypothesis could not be rejected. For the current account balance variable, the null hypothesis was rejected at 1% level of significance. It was concluded that the current account balance was stationary in levels, therefore integrated of order zero. To sum up the findings, for all other variables, the null hypothesis was rejected in the first differences. It was concluded that all the other variables were integrated of order one, I (1).

4.4. Bound cointegration test

To test for cointegration, the study applied an ARDL bound test proposed by Pesaran, Shin and Smith (2001) to identify the long run determinants of sovereign bond yield spread... The existence of cointegration in the model implies that there is a long run equilibrium relationship between the sovereign bond yield spread, GDP growth rate, Current account balance and inflation rate. The findings of the bound test of cointegration are exhibited in Table 4.3 below.

Table 4.3 Bound test results

F-statistic = 7.379		
Critical value	Lower bound I(0)	Upper bound I(1)
1%	4.093	5.532
5%	2.947	4.088
10%	2.525	3.56

The bound test results show that there is a long run relationship between the sovereign bond yield spread, GDP growth rate, government debts, current account balance, and inflation rate in Namibia. Given that the computed ARDL F-statistic is greater than the upper bound at 1% level of significance. The null hypothesis of no cointegration was rejected and the alternative hypothesis was accepted. The results were tested at the critical value of 1%, 5% and 10% to the F-statistic developed by Narayan (2005). The study findings on the cointegration test suggest that variables in the model have a long-run association.

4.5 Long run results

Table 4.4 below represents the long run estimated results. After the bound cointegration test is conducted, the next step is to determine the long run relationship between the sovereign bond yield spread and its potential determinants.

Table 4.4 Estimate Long run model, ARDL (1, 3, 0, 3, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
<i>Spread</i> (-1)	0.521	0.123	4.232	0.000
<i>Growthr</i> (-3)	0.006	0.003	1.811	0.085
<i>Debtgdp</i>	0.003	0.002	1.228	0.233
<i>CA</i> (-3)	-0.004	0.002	-1.680	0.108
<i>Inf</i>	0.034	0.013	2.632	0.016
C	0.069	0.193	0.357	0.725

The results presented in tables 4.4 confirm that the variable coefficient of inflation rate is positive and significant with a confidence level of 95% and have the expected sign. It means that change in the inflation rate positively affects the sovereign bond yield spread ceteris paribus. The coefficient value of 0.034 indicates that an increase of 1 unit in the

inflation rate, in the long run, will increase the sovereign bond yield spread by 0.034 units. The sovereign bond yield spread for the previous quarter has a positive effect and is statistically significant with a confidence level of 99%. It means that a change in the sovereign bond yield spread in the previous quarter affects the sovereign bond yield spread in the current quarter positively, *ceteris paribus*. The coefficient value of 0.521 indicates that an increase of 1 unit of sovereign bond yield spread in the previous quarter will increase the sovereign bond yield spread by 0.521 units in the current quarter, *ceteris paribus*.

The GDP growth rate has a positive effect and is statistically significant with a confidence level of 90% and has the expected sign. The GDP growth rate affects bond yield spread with three lags. It means that a change in the GDP growth rate will only affect the sovereign bond yield spread after three quarters. The coefficient value of 0.006 indicates that an increase of 1 unit of GDP growth rate in the current quarter, will increase the sovereign bond yield spread by 0.006 in the next three quarters, *ceteris paribus*.

The study is supported by recent findings by Fedderke (2020) who investigated South Africa – United States sovereign bond spread and its association with macroeconomic fundamentals. Their findings reveal that higher growth rate is associated with a rise in yield spread and higher inflation rate with higher yield spread. On the contrary, their study indicated that higher sovereign debts were associated with higher sovereign bond yield spread while in Namibia, according to the study's findings sovereign debt does not influence yield spread, thus a positive coefficient but statistically insignificant, implying no significant effect on the sovereign bond yield spread. Essert, Bloomstein, Cassimon and Flores (2014) argued that growth of an economy determines the yield spread on

government bond; when the economic growth surges the amount of sovereign debt reduces leading to lower sovereign bond yield.

The study findings are supported by Abdul Waheed (2017) who investigated the impact of export and import of oil and gas. They conducted a panel of 12 countries that export and 12 countries that import oil and gas. According to their findings, they found that countries with a higher GDP growth rate happen to have lower government debt. Their findings state that when a country has a good performing economy, they tended to be in surplus, which lowers the burden of out-sourcing funds through borrowing. Shamsuddin & Ganhi (2017) found similar results that the GDP growth rate had a positive statistically significant and long-run relationship between the sovereign bond spread after the ARDL Cointegration test was conducted.

Findings are also supported by Mishkin (2013) who argued that an increase in the inflation rate would lead to higher government bond yield spread, *ceteris paribus*. The author asserted that higher inflation rate decreases the real return that investors opt to receive from their investment. Similar support regarding the inflation rate is from Diebold and Rudebusch (2013) who investigated the determinants of the Nelson-Siegel yield factor and macroeconomic variables. Their findings exhibit that the Nelson-Siegel yield factor is influenced by the inflation rate. Bauer and Neely (2014) also indicated that the inflation surge has an impact on the yield curve.

Reilly and Brown (2000) stated that increases in bond price severely affect bond price if they are not indexed to inflation. This demonstrated that the increases in inflation put an upward (downward) pressure on the return of investors who always want to keep their real return on investment. The author furthermore asserted that in the case of emerging

markets, inflation illustrates a leading indicator of a balance of payment crisis and it is a proxy for the quality of economic management that directly influences the sovereign default risk.

The Taylor rule (1993) argued that a 1% increase in inflation prompted the central bank to raise the normal interest rate by more than 1%, which unconditionally negatively affects the government bond price. However, the borrowing of money by sovereign, increases the money supply normally or in most cases leads to higher inflation in the future, since the consumer can predict the future price movements and therefore the same effect will apply to debt security as inflation is higher. The study is also supported by Akram and Das (2017) who investigated the variables associated with the long run yield of government bonds in India. Their findings reveal that inflation has a long run association with sovereign bond yield.

The current account balance has the expected negative sign but is statistically insignificant. It means that a change in the current account balance will not affect sovereign bond yield spread, *ceteris paribus*. Government debt has the expected positive sign but it is statistically insignificant, which means that the variable has no significant effect on the sovereign bond yield spread, *ceteris paribus*. A study conducted by Yieand and Chen (2019) found that government debts do not influence sovereign bond yield spread. This study's findings are supported by Origa (2019) who investigated the effect of selected macroeconomic variables on sovereign bond yield spreads in Kenya. The results exhibit that current account balance and government debts do not influence sovereign bond yield spreads.

The coefficient of determination of 87.7 per cent, demonstrates that GDP growth rate, current account balance, government debt and inflation rate explain the variation in government bond yield spreads. The remaining 12.3 per cent variation is attributed to other proxies not examined in this study.

4.6 Short run results

Table 4.5 presents the short run results. The estimated coefficient of the error correction terms (ECM) is significant and has an expected negative sign. The results in table 4.5 below indicates that the error correction term coefficient is negative and significant at 5 per cent significance level, it confirms the existence of cointegration between the variables.

Table 4.5 Short run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(<i>Growthr</i>)	-0.005	0.002	-1.973	0.059
D(<i>debtgdp(-1)</i>)	-0.004	0.005	-0.707	0.485
D(CA)	0.003	0.002	1.270	0.215
D(Inf)	0.073	0.016	4.596	0.000
ECM(-1)	-0.980	0.280	-3.500	0.002

The speed of adjustment of any deviations in the short run back to the equilibrium level in the long run is 98 per cent. The coefficient of GDP growth rate is negative, inflation rate is positive and is both statistically significant at 10% and 1% levels of significance, respectively. These findings suggest that the variables affect the sovereign bond yield spreads in the short run, moreover the coefficient of government debts in the previous

quarter is negative and current account balance is positive, however, they are both statistically insignificant. Implying that the two variables do not in the short run have an effect on the sovereign bond yield spreads. Study results can be confirmed in the short run by Gerlach, Schulz and Wolff (2010) who argued that poor economic performance in terms of negative GDP growth rate increases the bond issuance as the government sources more funds to finance its budget deficit. Von Bon (2015) who investigated the relationship between inflation and public debt found that there is a positive relationship between inflation (price level) and public debt which leads to sovereign bond spread in the short and long term. It, therefore, forces the investors to hedge the investment in sovereign bonds and as a result, the sovereign borrows more to offset the outstanding balance, as well as to maintain its normal expenditures such as the budget deficit, restructuring of debt and infrastructure development, before and or on the maturity of certain bonds.

4.7 Diagnostic tests

Table 4.5: Diagnostic tests

Test Purpose	Test-statistic	Probability
Normality test	Bera test:0.994	0.608
Serial correlation	<i>Breusch-Godfrey Serial Correlation</i> <i>LM Test: 2.181</i>	0.1404
Heteroscedasticity	<i>Breusch-Pagan-Godfrey</i> 0.343	0.965
Stability	<i>Ramsey RESET Test</i> 2.281	0.130

Table 4.5 presents the results for four tests conducted namely: normality, serial correlation, heteroscedasticity and stability test. The Jarque-Bera test is used to test if the

residuals from the estimation are normally distributed. Its null hypothesis is that the residuals are normally distributed. The normality test results above indicate that the null hypothesis of normality could not be rejected. It was therefore concluded that the residuals are normally distributed. The LM test was used to test for serial correlation in the residuals. Its null hypothesis is that there is no serial correlation. The LM test results above indicate that the null hypothesis could not be rejected at any reasonable level of significance.

The Breusch-Pagan-Godfrey test for heteroscedasticity was used. Its null hypothesis is that there is homoscedasticity. The test results above indicate that the null hypothesis could not be rejected. It was therefore concluded that there is no heteroscedasticity. The Ramsey reset test was used to assess model specification. Its null hypothesis is that the model is correctly specified. The test results above show that the null hypothesis could not be rejected. It was therefore concluded that the model was correctly specified.

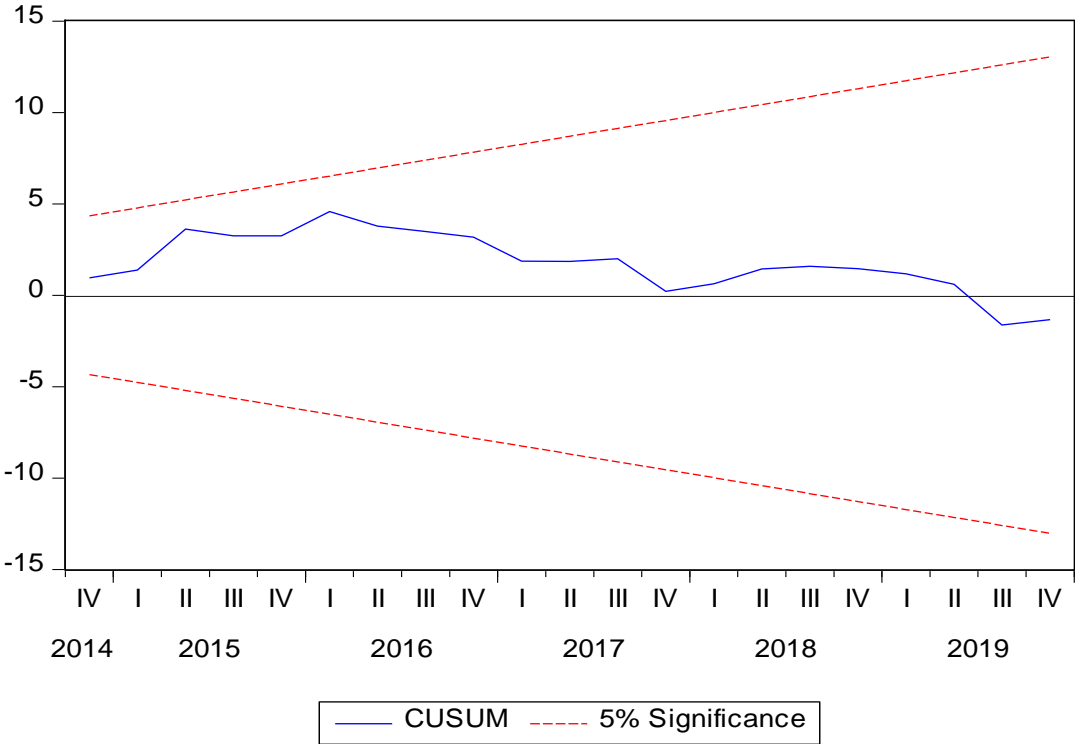


Figure. 1a CUSUM

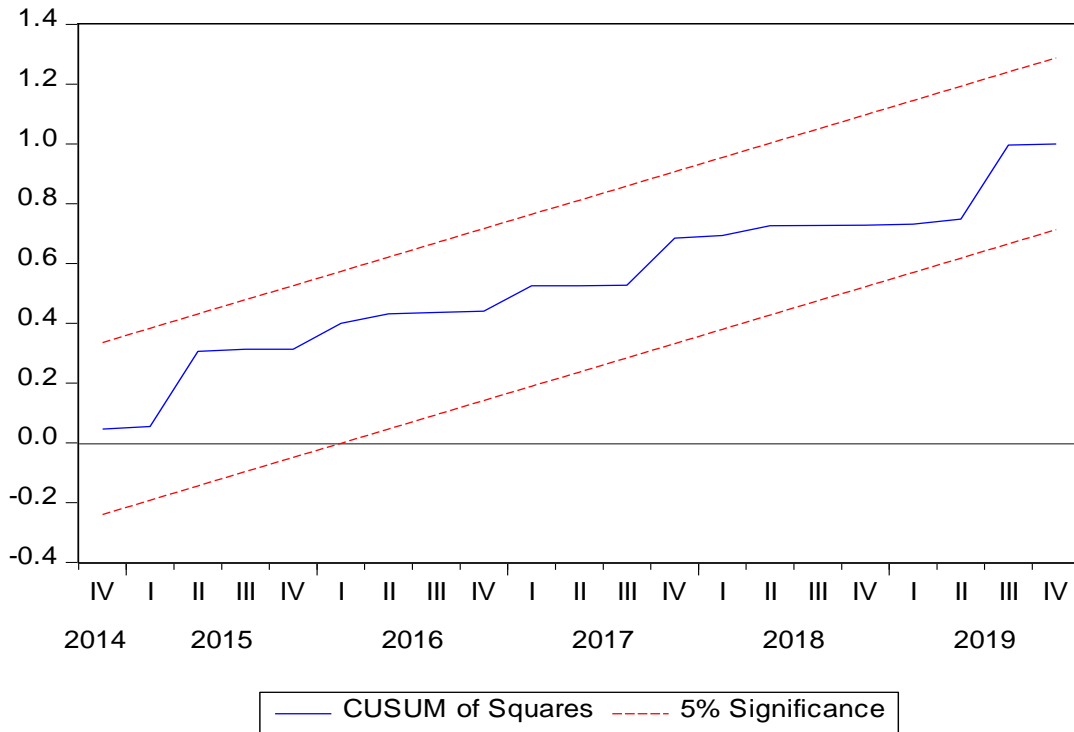


Figure 1b CUSUM of Squares

Figure 1 represents the Stability test, tested using the plot of the Cumulative Sum of Squares of Recursive Residuals. The CUSUM of Squares at the critical bound of 5% significance level is illustrated by the red lines.

Figure 1.a illustrates the result of the CUSUM test of the long run associate model, the graph presents stability observed in the variables and the blue line representing the coefficient are within the critical area at 5% significance level. The CUSUM test did not exceed the best lines which indicates that the model is a good fit. Figure 1.b The CUSUM of square graphs demonstrates the stability of the coefficient, the blue line is within the critical value of the red line

4.8 Summary

The main objective of the study was to investigate the determinants of yield spread in the

Namibian government bonds. The main focus was to understand what influences the government bond yield spread in Namibia and the Long run relationship that potential determinants have on the sovereign bond yield spread. The motive behind the study was to determine the driving force that influences the spread of the Namibia sovereign bonds. The study was necessary due to the concern on the public debt rising trends above 35 per cent of the targeted.

The descriptive statistic and unit root tests were carried out using the Augmented Dickey Full test and all variables show to be normally distributed and stationary at the first difference except Current account balance integrated of the order zero. The cointegration bound test and the long run relationship was observed in all selected variables. Results from the ARDL model for the long run estimates indicate that yield spread from the previous quarter have an influence on the current quarter of the yield spread. GDP growth rate lagged three times and inflation rate are positive and statistically significant influences of the sovereign bond yield spread in the fourth quarter for GDP growth rate and inflation rate in the current quarter.

Government debt as a percentage of GDP results indicates a positive statistically significant influence on sovereign bond yield. The current account balance lagged three times and negatively affects the sovereign bond yield spread in the fourth quarter but because of the insignificance of the variables, current account balance and government debts, it concluded that the impact of current account and government debts in Namibia is not important in explaining the sovereign bond yield spread in the short run and the long run. The empirical findings reveal that the GDP growth rate, government debt, current account balance and inflation rate explains 87.7 per cent of the variation in yield spread.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5 Introduction

This chapter presents the key findings from the research paper as to what determines the yield spread on sovereign bonds in Namibia. In addition to that, the chapter presents the conclusions and recommendations of the study and ends with suggested areas for future research.

5.1 Summary of the study and conclusions

The study investigated the determinants of yield spread on government bonds in Namibia. It delimited the sample period from 2011Q1 – 2019Q4 consisting of 36 observations. The empirical findings obtained from the research were to fulfil the objective of the research. The study used descriptive statistics to determine the position of the variables: GDP growth rate, government debt, current account balance and inflation rate. The findings observed were that all the distributed variables were fairly symmetric around the mean. Only the current account balance and inflation rate were skewed along the left tail, with a lower value.

The Jarque–Bera test for yield spread reported in table 4.1 with a probability of 0.96 is greater than the critical value of 0.05, indicating that the null hypothesis can be rejected. The rule of thumb implies that if the Jarque–Bera statistic has a probability greater than the critical value, the null hypothesis is rejected and vice versa. The variable Y ($0.96 > 0.05$) indicated a normal distribution.

The results imply that the other remaining variables reported in table 1 are also normally distributed, fairly to moderately close to mesokurtic. The study performed unit root tests,

ARDL bound test, estimations of the long run and short run model. The study further also performed diagnostic tests such as normality test, serial correlation, heteroscedasticity, Ramsey test, CUSUM and CUSUMSQ to test the Normality and stability of the model. The results present that the model was of good fit.

The results of the unit roots indicated that all variables were integrated of order one except for current account balance integrated of order zero and one. The results for the cointegration test performed revealed that there is an existence of a long run relationship between the GDP growth rate, government debts as a percentage of GDP, current account as a percentage of GDP and inflation rate. The estimation results for the ARDL long run model revealed that yield spread from the previous quarter was positive and statistically significant. This implied that the yield spread from the previous period, which is the previous quarter has a positive impact on the sovereign bond yield spread in the long run.

The GDP growth rate that is lagged three-times states that sovereign bond yield spread is positively affected by the GDP growth rate of the third quarter. Inflation is positive and statistically also significant in that it affects the sovereign bond yield spread positively in the short and long run. The study is supported by Tan and Yan (2008) who reveal that the inflation rate has a positively significant influence on the yield spread. Moreover, the study revealed that government debt and current account balance were positive and negative and verse vice in the short and long run but not statistically significant, meaning they don't affect the sovereign bond at all. The study presented that the speed of adjustment of any deviations in the short run back to the equilibrium level, in the long run, is 98 per cent every second quarter and the coefficient of determination was 87.7 per cent, demonstrating that GDP growth rate, current account balance, government debt and

inflation rate explain the variation in government bond yield spread.

5.2 Recommendations

The empirical findings of this study present some important policy implications for the policymakers in Namibia who are responsible for crafting sovereign bond yield policy decisions.

Firstly: The ARDL approach results in cointegration presented that there is a long run relationship exists between the sovereign bond yield and its selected potential determinants. This implies that all the potential variables have a potential impact and influence on the sovereign bond yield spread in the long run. The results present that the this can lead to deterioration in conditions now and in the future. Therefore, it is of utmost importance for those that are involved in policy making bodies that relate to sovereign bond yield in Namibia to carefully examine and take serious action on the impact and influence each of these determinants can have on the economy of Namibia at large.

Secondly: the fact that the results indicate that the GDP growth rate and inflation rate affect the sovereign bond spreads positively suggests that Namibia must look into areas of priority to improve the GDP growth rate. This can be done through the promotion of a trade liberation policy to attract exports competitiveness around the world and in the domestic market. The Government should promote policies that encourage the flexibility of trade between countries.

Thirdly: Namibian sovereign through the Ministry of Finance (MOF) or at large must take a proactive measure to improve the macroeconomic policies and quality of institutions to improve the sustainability of economic growth in the country. This involves

clearly defining the formulation of fiscal and monetary policy holistically to attract more economic activity in the country in the form of better access to regional investors. Implementing strict policies that adjust to changes in economic activity from time to time would also help. The sovereign can also borrow more funds internationally and in the local domestic market to boost economic activities through government bonds.

Fourthly: the government should engage with expert stakeholders in formulating or restructuring the economic policies that are seasonal so as to curb the changes in the economic environment and maintain the inflation rate at a low rate to boost a healthy macroeconomic environment. The Namibian government should also look into the utilisation of public funds through channelling them into proper economic sectors that are high “multipliers” and that can boost economic activity and increase the GDP growth rate, such as improvement in the tax system, investing in Agricultural, Education and health sector. The sovereign budget must always be reviewed quarterly to oversee which budget expenditures need more funds on the physical observation of the initial budget estimates aligning them in conjunction with the economic sector’s activity performance. This would assist the government in restructuring the unnecessary expenditures and reviewing performance in these sectors.

5.3 Areas for Further research

The study recommends a further in-depth study by introducing other independent variables in a similar study to identify the variables causing the 12.3 per cent changes in the sovereign bond spread as well as to expand the size sample to enhance the statistical outcomes of the research and gain a solid comparison of the determinants of sovereign bond yield spread in Namibia.

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7. APPENDICES

Appendix 1: Data Collected: 2011 to 2019

year	Quarterly	Government Yield spread	GDP Growth rate	Governments debt	Current account Balance	Inflation rate
2011	1	0.51	7.93	16.70	(11.40)	3.30
	2	0.68	2.88	19.40	(12.55)	5.05
	3	0.61	9.27	25.40	0.93	5.04
	4	0.78	0.43	26.20	(4.65)	6.60
2012	1	0.79	11.28	23.40	(12.96)	7.15
	2	0.94	6.26	23.70	(5.48)	6.24
	3	0.93	(4.30)	24.10	(12.01)	6.48
	4	0.99	7.73	27.70	(8.00)	7.02
2013	1	1.01	(3.37)	22.90	(4.12)	5.97
	2	0.96	8.50	23.70	(3.02)	5.95
	3	0.90	13.70	24.60	(16.94)	5.79
	4	0.83	4.43	25.30	(3.64)	4.73
2014	1	0.80	3.73	22.90	(6.76)	5.11
	2	0.92	5.02	23.10	(5.79)	6.03
	3	0.87	3.91	23.90	(11.55)	5.42
	4	0.79	10.33	25.60	(11.68)	4.90
2015	1	0.71	8.22	26.20	(12.69)	3.80
	2	0.83	5.07	28.40	(12.81)	3.00
	3	0.83	4.79	38.10	(19.52)	3.30

		4	0.92	0.44	40.20	(8.77)	3.50
2016		1	1.10	2.86	38.20	(11.95)	6.00
		2	1.10	(2.39)	39.20	(16.94)	6.70
		3	1.10	(1.57)	40.20	(19.34)	6.90
		4	1.17	0.08	41.60	(21.66)	7.30
2017		1	1.17	(1.61)	41.10	(5.57)	7.70
		2	1.17	0.66	42.30	(4.38)	6.40
		3	1.17	(1.62)	42.40	0.42	5.50
		4	0.90	1.58	43.10	(7.57)	5.20
2018		1	0.86	1.97	44.00	(3.09)	3.50
		2	0.86	4.13	45.20	(4.48)	3.79
		3	0.90	0.72	48.60	(3.46)	4.55
		4	0.92	(3.82)	49.10	(2.11)	5.27
2019		1	0.92	(2.41)	49.70	0.88	4.53
		2	0.85	(2.48)	51.70	(6.43)	4.17
		3	0.66	(1.19)	52.70	(3.38)	3.53
		4	0.70	1.62	56.80	(1.14)	2.70

Appendix 2: Test results

Figures 2. 1-5 Plot of time series



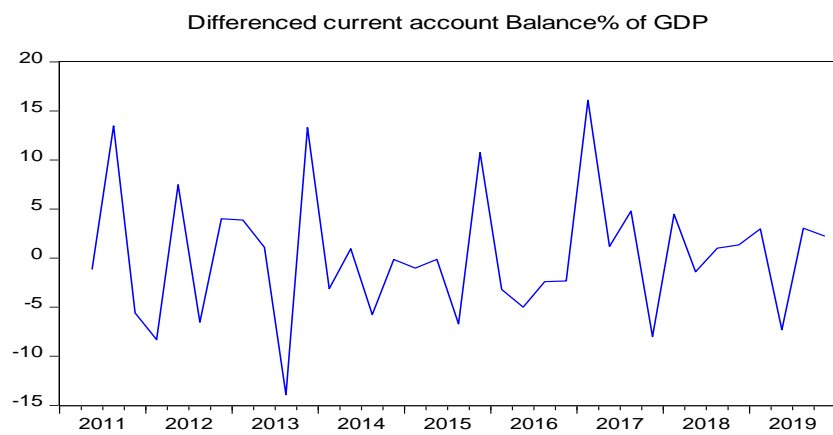
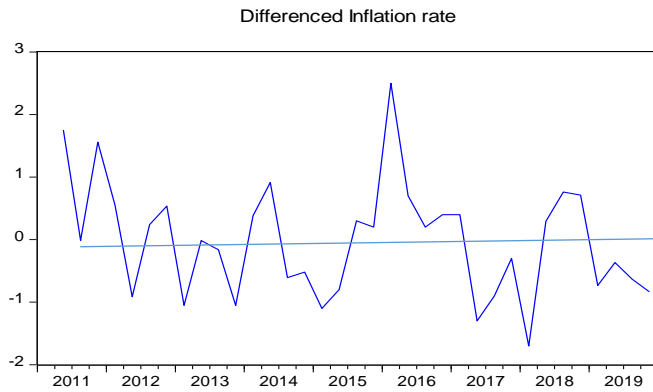


Figure 2: Time series plot for government yield spread, difference GDP growth rate, difference government debt, difference current account balance, difference inflation rate

Null Hypothesis: **Spread** has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.011287	0.2808
Test critical values: 1% level	-3.639407	

5% level	-2.951125
10% level	-2.614300

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

Null Hypothesis: **Growthr** has a unit root

Exogenous: Constant

Lag Length: 4 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.278580	0.6267
Test critical values:		
1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

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

Null Hypothesis: **debtgdp** has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.023341	0.9500
Test critical values:		
1% level	-3.632900	
5% level	-2.948404	
10% level	-2.612874	

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

Null Hypothesis: **CA** has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.669592	0.0091
Test critical values:		
1% level	-3.632900	
5% level	-2.948404	
10% level	-2.612874	

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

Null Hypothesis: **Inf** has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.088795	0.2502
Test critical values:		
1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

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

Level Form: Intercept and Trend

Null Hypothesis: **Spread** has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.945234	0.6098
Test critical values:		
1% level	-4.243644	
5% level	-3.544284	
10% level	-3.204699	

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

Null Hypothesis: **Growthr** has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 6 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.643041	0.2656
Test critical values:		
1% level	-4.309824	
5% level	-3.574244	
10% level	-3.221728	

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

Null Hypothesis: **debtgdp** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 1 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.041413	0.5586
Test critical values:		
1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

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

Null Hypothesis: **CA** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.769488	0.0305
Test critical values:		
1% level	-4.243644	
5% level	-3.544284	
10% level	-3.204699	

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

Null Hypothesis: **Inf** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 1 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.480107	0.3352
Test critical values:		
1% level	-4.252879	

5% level	-3.548490
10% level	-3.207094

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

First difference: Intercept

Null Hypothesis: **D (Spread)** has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.638187	0.0000
Test critical values: 1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

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

Null Hypothesis: **D (Growthr)** has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.816592	0.0000
Test critical values: 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

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

Null Hypothesis: **D (Debtgdp)** has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.185038	0.0002
Test critical values: 1% level	-3.639407	

5% level	-2.951125
10% level	-2.614300

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

Null Hypothesis: **D (CA)** has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.782434	0.0000
Test critical values:		
1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

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

Null Hypothesis: **D (Inf)** has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.830617	0.0004
Test critical values:		
1% level	-3.639407	
5% level	-2.951125	
10% level	-2.614300	

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

First difference: Intercept and Trend

Null Hypothesis: **D (Spread)** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.868935	0.0002
Test critical values:		
1% level	-4.252879	
5% level	-3.548490	

10% level -3.207094

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

Null Hypothesis: **D (Growthr)** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 3 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.638797	0.0003
Test critical values:		
1% level	-4.284580	
5% level	-3.562882	
10% level	-3.215267	

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

Null Hypothesis: **D (Debtgdp)** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.179651	0.0009
Test critical values:		
1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

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

Null Hypothesis: **D (CA)** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.648976	0.0000
Test critical values:		
1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

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

Null Hypothesis: **D (Inf)** has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on AIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.839432	0.0023
Test critical values: 1% level	-4.252879	
5% level	-3.548490	
10% level	-3.207094	

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

Bound Cointegration Results

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.379054	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37
			Finite Sample: n=35	
Actual Sample Size	32	10%	2.46	3.46
		5%	2.947	4.088
		1%	4.093	5.532
			Finite Sample: n=30	
		10%	2.525	3.56
		5%	3.058	4.223
		1%	4.28	5.84

ARDL model equation: Long run Equation estimates ARDL (1, 3, 0, 3, and 0)

Dependent Variable: Y
 Method: Least Squares
 Date: 01/06/21 Time: 01:52
 Sample (adjusted): 2011Q4 2019Q4
 Included observations: 33 after adjustments

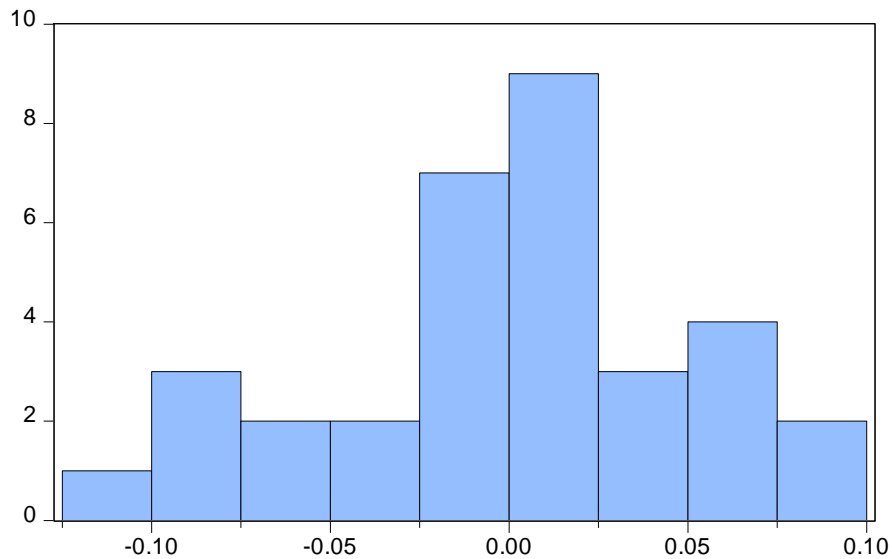
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Spread(-1)	0.520496	0.122978	4.232440	0.0004
Growthr	-0.000756	0.003507	-0.215676	0.8313
Growthr (-1)	0.002254	0.003787	0.595220	0.5581
Growthr (-2)	-0.000662	0.003218	-0.205709	0.8390
Growthr (-3)	0.005639	0.003114	1.811030	0.0845
debtgdp	0.002981	0.002427	1.228441	0.2329
CA	0.003280	0.002290	1.432425	0.1667
CA(-1)	-0.002907	0.002133	-1.362618	0.1874
CA (-2)	-0.004653	0.002192	-2.122299	0.0459
CA (-3)	-0.003887	0.002314	-1.679461	0.1079
Inf	0.033626	0.012777	2.631859	0.0156
C	0.068970	0.193363	0.356689	0.7249
R-squared	0.877407	Mean dependent var		0.920273
Adjusted R-squared	0.813192	S.D. dependent var		0.139311
S.E. of regression	0.060212	Akaike info criterion		-2.506610
Sum squared resid	0.076135	Schwarz criterion		-1.962425
Log likelihood	53.35906	Hannan-Quinn criter.		-2.323508
F-statistic	13.66356	Durbin-Watson stat		2.291510
Prob(F-statistic)	0.000000			

Short run model

Dependent Variable: D(Y)
 Method: Least Squares
 Date: 01/09/21 Time: 19:52
 Sample (adjusted): 2012Q1 2019Q4
 Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(Growthr)	-0.004794	0.002430	-1.973184	0.0588
D(Debtgdp(-1))	-0.003632	0.005135	-0.707404	0.4854
D(CA)	0.002627	0.002068	1.270057	0.2149
D(Inf)	0.072744	0.015829	4.595542	0.0001
ECM-1	-0.979685	0.279884	-3.500323	0.0016
R-squared	0.504801	Mean dependent var		-0.002382
Adjusted R-squared	0.431438	S.D. dependent var		0.087933
S.E. of regression	0.066304	Akaike info criterion		-2.446537
Sum squared resid	0.118697	Schwarz criterion		-2.217515
Log likelihood	44.14459	Hannan-Quinn criter.		-2.370623
Durbin-Watson stat	1.999149			

Normality test



Series: Residuals
 Sample 2011Q4 2019Q4
 Observations 33

Mean 2.02e-16
 Median 0.008385
 Maximum 0.083830
 Minimum -0.113953
 Std. Dev. 0.048777
 Skewness -0.392312
 Kurtosis 2.672202

Jarque-Bera 0.994245
 Probability 0.608278

Serial correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.180787	Prob. F(2,19)	0.1404
Obs*R-squared	6.161055	Prob. Chi-Square(2)	0.0459

Heteroscedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.343201	Prob. F(11,21)	0.9646
Obs*R-squared	5.028489	Prob. Chi-Square(11)	0.9298
Scaled explained SS	1.702578	Prob. Chi-Square(11)	0.9993

Stability test

Ramsey RESET Test

Equation: ARDLRESULTS

Specification: Spread Spread(-1) Growthr Growthr(-1) Growthr (-2) Growthr (-3)
 debtdgp CA(-1) CA(-2) CA(-3) Inf

C

Omitted Variables: Powers of fitted values from 2 to 3

	Value	df	Probability
F-statistic	2.280454	(2, 19)	0.1295

APPENDIX 3: LANGUAGE EDITING CERTIFICATE



The Rev. Dr. Greenfield Mwakipesile

ThD, MBA, HBS | mwakipg@outlook.com

CONTACT

PO Box 99539,
UNAM,
Namibia

LANGUAGE & COPY-EDITING CERTIFICATE

25th November 2020

RE: LANGUAGE, COPYEDITING AND PROOFREADING OF VALENTINUS MASONDE SINDONGO'S THESIS FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE OF THE NAMIBIA BUSINESS SCHOOL OF THE UNIVERSITY OF NAMIBIA

This certificate serves to confirm that I copyedited and proofread **VALENTINUS MASONDE SINDONGO'S** Thesis for the **MASTER OF BUSINESS ADMINISTRATION DEGREE** entitled: **INVESTIGATING THE DETERMINANTS OF SOVEREIGN BOND YIELD SPREAD IN THE NAMIBIAN CONTEXT**

I declare that I professionally copyedited and proofread the thesis and removed mistakes and errors in spelling, grammar, and punctuation. In some cases, I improved sentence construction without changing the content provided by the student. I also removed some typographical errors from the thesis and formatted the thesis so that it complies with the University of Namibia's guidelines.

I am a trained language and copy editor and have edited many Postgraduate Diploma, Masters' Thesis, Dissertations and Doctoral Dissertations for students studying with universities in Namibia, Zimbabwe, Eswatini, South Africa and abroad. I have also copy-edited company documents for companies in the region and abroad.

Please feel free to contact me should the need arise.

Yours Sincerely,

A handwritten signature in black ink, appearing to read "Dr. Greenfield Mwakipesile".

The Rev. Dr. Greenfield Mwakipesile



greenfield.mwakipesile



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Dr. Greenfield
Mwakipesile