DYNAMIC INTERACTION BETWEEN MACROECONOMIC INDICATORS AND ASSET MARKETS IN NAMIBIA

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Abstract

The researcher examined the dynamic interaction between macroeconomic indicators and the asset markets in Namibia between 1995 and 2018. The study aimed at addressing four specific objectives. Firstly, the study gives an overview of the macroeconomic indicators in Namibia, the asset market's evolution and the Namibian financial market. Secondly, the study analyses the relationship between the stock market and the macroeconomic indicators in Namibia. The stock market was tested for volatility using the ARCH/GARCH tests. The ARDL model together with the ECM model was used to assess the nature of the relationship between the stock market and the macroeconomic indicators in Namibia. The results showed that the Namibian stock market was not volatile. The results also confirmed a short and long-run relationship between the Namibian stock market and the macroeconomic indicators, seen especially through real exchange rates. Furthermore, a unidirectional causal relationship between the stock market and the macroeconomic indicators was revealed. Thirdly, the study investigated the relationship between the foreign exchange market and the macroeconomic indicators in Namibia. The ARCH/GARCH, the TGARCH and the EGARCH tests confirmed volatility in the foreign exchange market. The ECM test indicated that the volatility in the Namibian foreign exchange market can be explained by the macroeconomic indicators in Namibia. Additionally, the ECM test indicated that there was indeed a relationship between the foreign exchange market and the macroeconomic indicators in Namibia. The fourth objective tested the relationship between the housing market and the macroeconomic indicators in Namibia. The SVAR test confirmed the relationship between the housing market and macroeconomic indicators in Namibia. The results indicated that the housing market responded to shocks in the macroeconomic indicators in Namibia. Similarly, although the housing market explained most of its innovations, the macroeconomic indicators contributed to fluctuations in the housing market as well. The Granger Causality Test indicated that there was a unidirectional causal relationship between the housing market and the macroeconomic indicators in Namibia. Monetary policy expansion was recommended to promote macroeconomic objectives through the Namibian stock market and the Namibian foreign exchange. Fiscal policy will be appropriate in dealing with the

volatilities in the foreign exchange market. Monetary policy contraction was recommended to promote the housing market through credit availability.

Keywords: Macroeconomic indicators, stock market, foreign exchange market, the housing market, real exchange rates, volatility, vector Autoregression

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Dedication

This thesis is dedicated to my parents, Mr. and Mrs. Kalumbu, for giving me the opportunity, sacrificing and standing by me until the end of this program. It is also dedicated to my brothers Gideon and Thomas, as well as to all my friends who stood by me during my studies. If it was not for them, this could have not been possible.

Declarations

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

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

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List of Abbreviations

ADF - Augmented Dickey-Fuller

EA - Euro Area

AGARCH - Asymmetry Generalized Autoregressive Conditional Heteroscedasticity

AGRIBANK - Agricultural Bank of Namibia

APT - Arbitrage Pricing Theory

ARCH - Autoregressive Conditional Heteroscedasticity

BON - Bank of Namibia

BTP - Build Together Programme

CAPM - Capital Asset Pricing Model

CMA - Common Monetary Area

CPI - Consumer Price Index

CSIB - City Savings and Investment Bank

DBN - Development Bank of Namibia

ECM - Error Correction Model

EMH - Efficient Market Hypothesis

FNB - First National Bank

F-VAR - Factor Vector Autoregressive

GARCH - Generalized Autoregressive Conditional Heteroscedasticity

GDP - Gross Domestic Product

GIPF - Government Institution Pension Fund

GNDI – Gross National Disposable Income

GRNE - Government Expenditure

I – Investment

INFL - Inflation

IP - Industrial Production

IR - Real Interest Rate

IS-LM - Investment saving- Liquidity preference Money supply

JSE - Johannesburg Stock Exchange

KPSS - Kwiatkowski Phillips Schmidt Shin

LM- Langrage Multiplier

M2 - Money Supply

MS - Markov Switching

NAMFISA - Namibian Financial Institution Supervisory Services

NHE - National Housing Enterprise

NSX - Namibia Stock Exchange

OECD - Organization for Economic Co-operation and Development

POSB - Post office Saving Bank

PP - Phillips-Peron

PVM - Present Value Model

RER - Real Exchange Rates

RGDP – Real Gross Domestic Product

SARB - South African reserve bank

SBCGT - Small Business Credit Guarantee Trust

SDFN - Shack Dwellers Federation of Namibia

SM - Stock Market

SVAR - Structural Vector Autoregressive

SVECM – Structural Vector Error Correction Model

SWABOU - South West African Building Society

TAR - Threshold Autoregressive

TECM - Threshold Error Correction Model

TOT - Terms of Trade

UK - United Kingdom

US - United States

VAR - Vector Autoregression

VEC - Vector Error Correction

VECM - Vector Error Correction Model

Chapter One: Introduction

1.1 Introduction

This part of the thesis introduces the macroeconomic activities variables together with asset markets. Macroeconomic activities display how the economy is performing. To be specific, macroeconomics is viewed as the performance of the national economy (Parkin, 2014; 2019). Macroeconomic activities of a country are presented by analyzing the trend of indicators such as the total production and the level of employment along with the level of inflation within that country. An asset market is a place where traders buy and sell assets at a given price level (Kurlat, 2016). There are different types of assets in an economy, thus there are different types of asset markets. Some asset markets trade financial assets such as bonds, while others trade non-financial assets such as houses. To follow the trend in the asset markets, specific indicators such as asset prices are observed over time. The macroeconomic activity indicators are known to react to changes in asset markets, and thus this study aimed to analyze the interaction between the macroeconomic indicators and the three selected asset markets in Namibia.

This chapter is organized in the following manner: firstly, the orientation of the study is presented. This is where the general link between the macroeconomic indicators and the asset markets is presented. Secondly, the problem statement is presented, where the knowledge gap in the literature is outlined. Thirdly, the objectives of the study are presented, followed by the research hypotheses. After that, the fifth part of this chapter discusses the significance of the study after which the limitations and delimitations of the study are presented. Lastly, the outline of the rest of the chapters in this study is presented.

1.2 Orientation of the Study

All countries aim for sustainable and well-performing economies, and Namibia is no exception. Various variables are used to measure the wellbeing or the health of an economy. The latter includes the gross domestic product, government expenditure, money supply, investment, inflation, real exchange rate, gross national income, and terms of trade along with real interest rate as discussed below. To start with, the overall economy includes the products that it produces and how those products are produced. That is in agreement with Goodwin, Nelson and Harris (2008) who explained that the performance of the economy is usually viewed from a macroeconomic point of view, which shows how individual economic activities merge and create an overall economic environment, both at national and global levels. Particularly Goodwin et al. (2008) stated that macroeconomic activities can be evaluated in terms of gross domestic product (GDP). Gross domestic product is a representation of the overall amount of goods and services an economy can produce at a given point in time (Parkin, 2014, 2019).

According to Kohler, Laky, Rhodes, Saayman, Schoer, Scholtz and Thompson (2010), GDP is known to have a positive impact on the economy. An increase in productivity increases economic activities through consumption and spending, thus the positive relationship. Government expenditure can also reflect the macroeconomic activities of a nation, especially when the economy relies heavily on the government. According to Parkin (2014; 2019), government expenditure is the amount of good and services the government has consumed at a given point in time. Government expenditure is most likely to have either a positive or a negative effect on the macroeconomic activities of a country.

A positive reaction is reflected by an increase in overall consumption. Since the government is one of the economic agents, an increase in government consumption can increase the overall economic consumption, which increases GDP.

An increase in government expenditure might reduce macroeconomic activities through a reduction in household consumption. Government expenditure depends on income tax at most (Parkin, 2014). An increase in government expenditure might reduce consumption through the tax multiplier, and in turn, reduce the overall consumption as well as GDP. Similarly, economic activities can be reflected through gross disposable income. The latter is the amount of money that the consumers are left with after all the deductions. Other things being the same; it is assumed to be the amount of money that is left after tax deductions (Parkin, 2014). An increase in disposable income increases the consumption of goods and services, both domestically produced as well as imports. This increases GDP and improves macroeconomic activities.

Money supply also reflects macroeconomic activities. The money supply is the amount of money injected into an economy at a given point in time. The latter is mostly done by the Central Bank through monetary policies (Parkin, 2014; 2019). Money supply can have both a positive and negative impact on macroeconomic activities. If an increase in the money supply leads to an increase in the price level of goods and services, that impact macroeconomic activities. However, an increase in the supply of money stimulates consumption, which increases GDP through spending, and thus improves macroeconomic activities.

Also, an investment can affect macroeconomic activities at a national level. Investment can be defined as the number of goods and services businesses spend in an economy

because they expect to make a profit and returns from them (Parkin, 2014; 2019). Thus, investment is known to have a positive effect on macroeconomic activities. An increase in investment increases both consumption and production. This is the process that increases GDP and macroeconomic activities, respectively.

Inflation also affects macroeconomic activities on a national economic level. Inflation occurs when there is a persistent increase in the price level (Parkin, 2014; 2019). Inflation affects macroeconomic activities through income, productivity and unemployment. A high inflation rate reduces the purchasing power of consumers, which in return reduces consumption and GDP. This in the end will worsen the macroeconomic activities. Interest rate is also one of the economic indicators that affect macroeconomic activities. Interest rate is the cost of holding money, or better yet, the number of expected returns (Parkin, 2014; 2019). The interest rate has both negative and positive effects on macroeconomic activities. On the one hand, an increase in interest rates increases the level of investments and savings in an economy. This in turn increases the availability of funds, which increases production through borrowing. This improves macroeconomic activities. On the other hand, an increase in interest rate would reduce borrowing, which in turn reduces consumption and GDP. This would worsen the macroeconomic activities.

Other economic indicators affect macroeconomic activities globally. One of such indicators is the exchange rate which negatively impacts the macroeconomic activities of an economy (Goodwin *et al*., 2008). The exchange rate is the price of one currency in terms of the other (Parkin, 2014; 2019). The exchange rates are known to be volatile, and their impact on macroeconomic activities is reflected through trade. Trade can be defined as the difference between imports and exports of an open economy. When the price of the

domestic currency goes up, the domestic currency appreciates. The latter will make the local good and services expensive in comparison to imports. The appreciation of the domestic currency makes foreign goods relatively cheaper and hence, import increases. The latter will, in the process, reduce the demand for local good and services, worsening the trade balance and the macroeconomic activities in general. All those indicators discussed above can reflect the macroeconomic activities, and they can also be reflected through asset markets.

Apart from the economic indicators, the macroeconomic activities can also be reflected through the asset market. Barakat, Eleazar and Hanafy (2016) stated that asset markets improve the quality and the efficiency of the domestic financial market that returns improve macroeconomic activities and develop the country. Scholars such as Weave and Wieladek (2016) stated that an increase in the purchase of assets can be reflected through economic indicators such as interest rates. The consumption of assets reflects macroeconomic activities through an increase in indicators such as real gross domestic product, inflation and real interest rates (Weave & Wieladek, 2016). Furthermore, Powel and Shestakova (2016) stated that the prices of assets in an economy can reflect the value of assets in that economy. They further stated that the asset prices also indicate efficiency, stating that an efficient asset market can help channel investments, which improves macroeconomic activities. Economic indicators such as inflation and industrial production together with interest rates are important drivers of asset prices (Mo, Gupta, Li & Singh, 2018).

The macroeconomic indicators do not only indicate economic development, but they also provide economic information about the asset markets. Such information helps

policymakers formulate appropriate policies. It also helps investors to make informed decisions (Amtiran, Indiastuti, Nidar & Masyita, 2017). One of the asset markets that can reflect macroeconomic activities is the stock market. The stock market is a market where traders meet to sell and buy financial assets such as bonds and securities. The stock market is sensitive to economic conditions (Barakat *et al*., 2016). The stock market interacts with the macroeconomic activities through indicators such as money supply, inflation, interest rate together with total production. If, for instance, the Central Bank adopts a contractionary monetary policy, the supply will increase, and the interest rate will fall in the process (Barakat *et al*., 2016). The stock prices, which is the major indicator of the stock market, determine the flow of capital in an economy. Barakat *et al*. (2016) further stated that changes in the stock prices in the domestic economy would have an impact on the wealth of cooperates as well as on the wealth of the country.

Likewise, the exchange market also interacts with macroeconomic indicators. The interaction between the two is mostly reflected through GDP, inflation, interest rates, investment and trade (Magaravalli & Vikram, 2016). Volatilities in the exchange market have an impact on the economic indicators, which reflect macroeconomic indicators. Magaravalli and Vikram (2016) indicated that volatilities in the exchange rate reflect uncertainty in international trade of goods and services together with financial assets. The interaction of the macro-economy and the exchange rate market can be controlled through trade restrictions and trade policies (Powell & Shestakova, 2016). A depreciation of the local currency will result in the local economy being competitive in the international market, which might improve macroeconomic activities.

The housing market is another important asset market in a country. The housing market is mostly large and volatile (Favilukis, Ludvigson & Van Nieuwerburgh, 2016). Bindu, Chigusiwa, Mazambani, Muchabaiwa and Mudavanhu (2011) stated that housing makes up most of the household wealth. Since housing is considered part of household consumption in literature, the housing market interacts with macroeconomic activities mostly through the interest rate, investment, gross disposable income and GDP amongst others (Sunde & Muzindutsi, 2017). Housing is one of the important parts of the household investment portfolio (Anim-Odame & FGhIS, 2016). An increase in interest rate, for instance, would reduce borrowing and household wealth. This in turn would decrease the demand for housing and reduce the price of houses in the long run. If the Central Bank adopts an expansionary monetary policy by reducing interest rates, borrowing will increase, which in the process might increase the consumption of houses (Bachmann & Rüth, 2020). Although the latter might be the case, Bindu *et al.* (2016) indicated that in less developed countries, housing wealth is less liquid because it is not bought for speculative motives. This differentiates between the different motives of buying a house in developed and developing economies.

Global financial crises are mostly transmitted to the economies through asset markets, especially the developing economies. Global financial conditions have an increasing effect on the asset markets in developing countries (Yildirim, 2016). According to Almansour, Aslam, Bluedorn and Duttagupta (2015), the 2008-2009 world financial crisis had an impact on emerging economies' growth dynamics, through external shocks. Almansour et al. (2015) further explained that open emerging economies and countries that were exposed to advanced economies were mostly hit because the external shocks

came through the exchange rates along. A financial crisis, through exchange rates, is most likely to worsen the trade balance of emerging economies, in comparison to advanced economies, which would deteriorate macroeconomic activities of emerging economies.

Furthermore, the financial crisis also affected the growth of developing countries through capital flow (Almansour *et al*., 2015). An increase in the interest rate of developed economies increases the interest of the developing economies which makes them worse off. An increase in the interest rate in advanced countries would divert capital and investments from developing countries (Yildirim, 2016). Investors will be attracted to the high-interest rates in the advanced economies. Yildirim (2016) further stated that the asset markets in emerging countries are most vulnerable to sudden changes in the global financial markets because, at most, the capital inflow into developing countries is owned by foreigners in advanced countries. These effects have a long-lasting impact on the less developed countries since most of them owe the advanced economies.

Namibia is one of the small less developed economies in Africa. The Namibian economy is open and trades with the rest of the world. However, by being a small economy, Namibia heavily depends on the extraction of raw materials. Namibian exports are made up of live animals, fish, crustaceans, ores, diamonds alongside other precious metals (Namibian Statistics Agency, 2017). According to the report by the Bank of Namibia (2016), the export of minerals contributes a fair portion to the Namibian exports, having contributed about 42.3% in 2012 and about 44.7% by the end of 2015. The contribution of exports to GDP fell, accounting for around 48% to total GDP in 2016 and around 35% by the end of 2017 (Namibian Statistics Agency, 2017). South Africa, Botswana and Switzerland are the top three countries Namibia exports to. According to the Namibian Statistics Agency

(2017), South Africa was the top export destination, accounting for 24%, followed by Botswana accounting for 13% and Switzerland for 10%.

The Namibian economy is also heavily dependent on the import of goods and services, most of which come from South Africa. The Bank of Namibia (2016) further indicated that imports contributed around 58% to the Namibian gross domestic product in 2012, an amount which increased to about 68% by the end of 2016. By the end of 2017 imports accounted for more than 46% of the gross domestic product in Namibia, with South Africa contributing the largest share. According to the Namibian Statistics Agency (2017), 56% of Namibian total imports came from South Africa, while the rest came from Bulgaria and Botswana amongst others. Imports mainly include mineral fuels and oils alongside manufactured products. Namibia does not have oil resources and the manufacturing base is quite small, that is why it fully depends on the import of all its fuel needs together with the manufactured products (Namibian Statistics Agency, 2017).

Despite being heavily dependent on imports and exports, the Namibian economy has been doing well, with fluctuations in economic growth following a trend averaging between 2% and 7% by the end of 2016 (Bank of Namibia, 2016). This has been fair in comparison to neighbouring economies such as Botswana that had a growth rate of -0.3% at the end of 2015 or South Africa that saw a 1.3% growth rate at the end of 2015. Other indicators such as inflation also show that the Namibian economy has been doing well, fluctuating between 1.4% and 10% between 1990 and 2015 respectively. The exchange rate has also been fluctuating. For example, the Namibian dollar against the US dollar stood at 0.28 in 1995, increased to 0.17 in 2005 and fell again to 0.067 at the end of 2015 (Bank of

Namibia, 2016). Unemployment stood around 28% in 2015 (Namibia Statistics Agency, 2014).

The Namibian economy is known for having a robust financial environment. According to Sheefeni and Nyambe (2016), the Namibian financial environment is dominated by commercial banks. In 2011 the Namibian banking sector consisted of the Central Bank and five commercial banks (Ministry of Finance, 2011). The number of commercial banks increased, standing at 9 commercial banks by the end of 2016 (Paavo, 2017). Bank of Namibia (2019), however, indicated that Namibia had 8 registered commercial banks by the end of 2018.

The Namibian Stock Exchange is also part of the Namibian financial market. It consists of dual-listed South African and Namibian companies. The number of listed companies was 12 in 2002, falling to 9 in 2005 and 7 by end of 2010. The number of listed companies stood at 43 by the end of 2017 (Namibian Stock Market, 2017). The Namibian Stock Market played a role in financial and investment dependence in Namibia and opened up the Namibian capital markets to international business (Namibian Stock Exchange, 2015). It also attracted market participants and reduced the cost of capital in Namibia over the years (Namibian Stock Exchange, 2017).

The Namibian Foreign Exchange Market has been performing well. Its performance reflected best through the Namibian trade balance. Namibia recorded the highest trade surplus of N$1.7 million in 2008 and the highest deficit of more than N$41 million in 2015. The Namibian trade balance has been in deficits between 2009 and 2017 (Namibian Statistics Agency, 2017). According to the Namibian Statistics Agency (2017), the trade

deficit declined by 27% in 2016 and continued to decline further by 18% by the end of 2017.

Other asset markets, such as the housing market, have been seeing an increase in the prices (First National Bank, 2015; 2017). House prices in Namibia have been increasing on average over the years (Kaulihowa & Kamati, 2019 and Sunde & Muzindutsi, 2017). The Namibian housing market mostly has a shortage of affordable housing, despite government efforts. This shortage of houses in Namibia goes back as far as 1990 when Namibia got its independence (Kaulihowa & Kamati, 2019).

Asset markets play a major role in macroeconomic activities, and the macroeconomic indicators also play a role in the asset market. The interactions of macroeconomic variables and stock markets are important in formulating macroeconomic policies (Mehrara, 2006; Alrub, Tursoy & Rjoub, 2016). The housing market is also of importance because housing contributes to household expenditure as well as to wealth (Leung, 2004). The foreign exchange market, through the exchange rate, influences macroeconomic activities through trade (Gradojevic, Erdemliogh & Gengay, 2017). It is in the light of the above that this study drew its primary interest to investigate the dynamic interactions between macroeconomic activities, asset markets and financial markets in Namibia.

1.3 Problem Statement

Namibia is heavily dependent on the South African economy. Almansour *et al*., (2015) stated that external shocks affect the growth of emerging economies. The scholar went on to point out that the effects are mostly felt by open economies. Namibia trades with relatively developed economies such as South Africa, China, the United States and others.

Namibia is therefore exposed to capital flow volatility. Any financial or economic disturbances that take place in South African and other advanced economies such as China are most likely to be transferred to the Namibian economy through the asset markets.

Countries with high current account deficits, high debt and lower gross domestic product accompanied by a high presence of foreign market experience more fluctuations in their asset markets (Yildirim, 2016). According to the Bank of Namibia (2017), economic growth averaged 4.3% between 2005 and 2011, while it was 4.8% between 2012 and 2017. While economic growth was fair, the current account of Namibia was in the deficit, standing at N$6.83 million by the end of 2017 (Bank of Namibia, 2017). Government debt in Namibia also increased. In 2016 the government debt was 40.7% of gross domestic product (Bank of Namibia, 2016). By the end of 2017 government debt had increased to 42.3%. The Namibian economy might therefore be exposed to fluctuations in the asset markets. Literature investigating the presence of volatility in the asset markets of a small, less developed country such as Namibia is scarce. There is a need to assess the presence of volatilities in the Namibian asset markets.

Similarly, literature is silent on how macroeconomic indicators and two or more asset markets interact in less developed countries. Scholars such as Azeez and Obalade (2018), Magweva and Mashamba (2016) and Worlu and Omodero (2017) carried out studies focusing on the stock markets of Nigeria, Zimbabwe, Ghana and Kenya. They found a relationship between the macroeconomic activity indicators and the stock markets of those countries. Close to home, Ntshangase, Mingiri and Palesa (2016) conducted a study on the stock market of South Africa and found a relationship between the stock market and macroeconomic indicators in South Africa. Sheefeni (2016) also conducted a study on the

stock exchange in Namibia. Scholars such as Megaravalli and Vikram (2016) did a study on the exchange market of India, while others such as Anim-Odame (2016) conducted a study on the housing market in Sub-Saharan Africa. Sunde and Muzindutsi (2017); Matongela (2015) coupled with Nuugulu, Amutoko, Julius and Vijayakumar (2019) together with Kaulihowa and Kamati (2019) conducted studies on the housing market of Namibia.

Despite all these studies, there is no comprehensive study on the assessment of the interaction between the macroeconomic indicators in a less developed country, combining these three asset markets. Studies done in the Namibian context do not combine the three asset markets. For instance, Sheefeni (2016) focused more on assessing the performance of the Namibian stock exchange rate. Nuugulu *et al*., (2019) focused on household debt while Sunde and Muzindutsi (2017) focused on the determinants of house prices and new construction activities. This study will assess the interaction between the macroeconomic indicators and the three asset markets in Namibia.

Namibia has a small, open economy, closely linked to the South African economy. Additionally, Namibia is part of the common monetary area with South Africa, Lesotho and Eswatini. Namibia differs from other economies such as Nigeria, Kenya, amongst others, where separate studies are done. Although scholars such as Benhabib, Lui and Wang (2016), as well as Ly (2012), did studies on macroeconomic fluctuations and asset markets in advanced countries. Literature investigating the interaction between macroeconomic indicators and asset markets in a less developed small open economy such as Namibia is not efficiently exposed, and thus there is a knowledge gap in the literature.

Moreover, Namibia's macroeconomic indicators showed fluctuations and these fluctuations might also be attributed to the volatilities in the asset and financial markets. The economic role of the financial and asset markets is relatively smaller in developing countries and less clear. Literature has shown that there is a relationship between macroeconomic indicators, financial and asset markets, though the relationship is ambiguous. It is against this background that this study intends to analyze how asset markets relate to macroeconomic indicators in Namibia. In particular, the study looks at how macroeconomic indicators affect the stock market, the foreign exchange market as well as the housing market.

1.4 Research Objectives

The main objective of the study is to investigate the dynamic interaction between macroeconomic indicators and asset markets in Namibia. The study will also review the evolution of the stock, foreign exchange and housing markets in Namibia. The specific objectives of the study are as follows:

- To examine the relationship between the stock market and macroeconomic indicators in Namibia
- To analyze the relationship between the foreign exchange market and the macroeconomic indicators in Namibia
- To investigate the relationship between the housing market and macroeconomic indicators in Namibia

1.5 Research Hypotheses

The hypotheses of the study are stated for the specific objectives stated above, and they are as follows:

Hypothesis 1

H_0: There is no relationship between the stock market and macroeconomic indicators in Namibia

H_1: There is a relationship between the stock market and macroeconomic indicators in Namibia

Hypothesis 2

H_0: There is no relationship between the foreign exchange market and the macroeconomic indicators in Namibia

H_1: There is a relationship between the foreign exchange market and the macroeconomic indicators in Namibia

Hypothesis 3

H_0: There is no relationship between the housing market and macroeconomic indicators in Namibia

H_1: There is a relationship between the housing market and macroeconomic indicators in Namibia

1.6 Significance of the Study

This study is important for the Namibian economy because it assessed the relationship between the macroeconomic indicators and the asset markets in Namibia. Namibia might be a small economy, but it trades with some of the world's largest economies such as China. Any economic disturbances from such economies can affect the Namibian economy directly through consumption or indirectly through the capital flow. The Namibian economy is exposed to such disturbances and they can be reflected through both the asset markets and macroeconomic indicators. There is a need to assess how the macroeconomic indicators and the asset markets interact in the Namibian economy. This study is therefore relevant to the Namibian economy.

The performance of the macroeconomic indicators such as gross domestic product, industrial production, interest rate, money supply, investments, government expenditure and gross national disposable income is important. It is reflected through the level of employment and productivity, which showcase the living standard of the nation. Additionally, understanding the background of macroeconomic performance helps with policymaking. The macroeconomic fundamentals are important because they give information that policymakers can use (Yildirim, 2016). The trend of the macroeconomic indicators can give guidelines to the policymakers. All the countries in the world use macroeconomic fundamentals when making policy decisions and Namibia is no exception. This study will add to the existing literature on macroeconomic indicators in Namibia, which will help improve the Namibian macroeconomic policy decisions.

Moreover, the study analyses some of the asset markets in Namibia, outlining their dynamic interaction with the macro-economy. The literature on macroeconomic indicators and two or more asset markets are not efficiently explored. Studies of this nature focusing specifically on small open economies such as Namibia are very scarce. Those that have been done focused on a single asset market, like those done by Worlu and Omodero (2017) and Matongela (2015) amongst others. This study will be one of the first to combine three asset markets; it will therefore add to the literature on macroeconomic indicators on the asset markets in open economies, as well as in small developing economies.

Also, Namibia is unique in comparison to other less developed countries. For example, Namibia is part of the common monetary area, where the Namibian dollar is pegged to the South African rand. Most financial policies in Namibia are guided and/or dependent on the South African Reserve Bank. Most studies such as those done by Asmy, Rohilina, Hassam and Amin (2010) on the Malaysian economy; Ustarz (2013) on Ghana and that by Bobai, Ubangida and Umar (2013) amongst others, focused on other countries. Those that have been done on the Namibian economy focused on separate asset markets. This study focused on the three asset markets and their interaction with the macroeconomic indicators in Namibia. This study gives insight and adds to the literature on the interaction between macroeconomic indicators and asset markets for an economy that is part of a common monetary area. This might serve as an example to other economies when weighing on the drawbacks and the benefits of being in a common monetary area.

Furthermore, the study gives an analytic view on policy variables such as interest rate, money supply and government expenditure. This might give an idea of how monetary

policies as well as fiscal policies of small open economies, being part of a common monetary area, affect the asset market. This study might serve as a guideline to policymakers on how to accommodate asset markets in the policy set up, as well as on how to improve the macro-economy through the asset market. The study might also serve as a guideline to investors interested in investing in the Namibian economy.

The study made use of a variety of modelling methodologies such as the Autoregressive Conditional Heteroscedasticity (ARCH) model, the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model, the Error Correction Model (ECM), the Vector Error Correction Model (VECM) and the Structural Vector Autoregressive model (SVAR) to assess the interaction of macroeconomic indicators and asset markets. The study will therefore shed light and add to the existing literature on the methodologies used to assess the dynamics of the asset markets and macroeconomic indicators in less developed countries.

1.7 Limitation of the Study

The limitation of this study is that it made use of data starting from 1995. This was mainly because data availability for some variables only started after 1990, for example, the stock prices. The Namibian Stock Market came into existence in 1992, thus their records started after that. To avoid threats to the robustness of the research, data for all the variables used started in 1995. Furthermore, there are many macroeconomic indicators of which not all could be used and/or incorporated in this study alone. Thus, the study made use of ten indicators that were selected per literature. They are the ones used by most scholars to assess the three asset markets. That being the case, the results might not give a full

reflection of the macroeconomic activities' reaction because the study did not make use of all the macroeconomic indicators.

Namibia is still a small upcoming economy and most information is limited. Due to the lack of information and literature on other asset markets, the study made use of three asset markets in Namibia. Thus, the study did not make use of all the variables in three asset markets, and as a result, the results might not be the full reflection of the asset markets in the Namibian economy.

1.8 Delimitations of the Study

To narrow down the scope of the study, the study aimed to achieve three objectives on the interaction between the asset markets and macroeconomic indicators in Namibia. Additionally, the study made use of quarterly data between 1995 and 2018. This is mainly because the study focused on the interaction between asset markets and macroeconomic indicators in Namibia after independence. Furthermore, there are many macroeconomic activity indicators in Namibia, however, the study made use of ten specific indicators instead of all of them. Specifically, the study made use of the real gross domestic product, money supply, real interest rate, inflation, gross national disposable income, industrial production, real exchange rate, terms of trade, government expenditure and investment. The reason for the selection of the ten macroeconomic indicators lies in the fact that they have been used in studies that looked at asset markets.

The study made use of three asset markets in Namibia, namely, the stock market, the foreign exchange market and the housing market. This was mainly because the three asset markets are some of the largest contributors to the Namibian economy, and they can reflect

the changes in the macroeconomic indicators. All these asset markets have many factors that influence their activities, nevertheless, the study chose the stock prices as a proxy for the stock market, the real exchange rate as a proxy for the foreign exchange market and the house price index as a proxy for the housing market. This decision was made based on literature.

Many methodologies could be used to assess a relationship between and amongst variables, but the researcher chose a specific methodology for each specific chapter. This decision was made based on the literature. For instance, the literature indicated the need to test for volatility in the stock and foreign exchange markets, therefore, the Autoregressive Conditional Heteroscedasticity (ARCH) Model and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model were adopted. The Error Correction (ECM), the Vector Error Correction (VECM) and the Structural Vector Autoregressive (SVAR) models were also used to test for the long- and short-run relationship between the asset market and the macroeconomic indicators in Namibia.

1.9 Chapter Outline

The remainder of the thesis contains five chapters and they are presented as follows:

Chapter two presents an overview of the macroeconomic indicators in Namibia. This gives a general picture of how the Namibian economy has been performing from a macroeconomic point of view. This chapter also presents an overview of the Namibian stock market and the introduction of the Namibian stock exchange market by reviewing its establishment and its performance over time under observation. Besides, chapter two introduces the Namibian foreign exchange market and provides a synopsis of its

performance. Also presented in this chapter is an overview of the Namibian housing market under which the performance and the outline of the housing market in Namibia are introduced and observed. Finally, an overview of the Namibian financial sector and that of the Namibian monetary policy are also provided in this chapter.

Chapter three presents the relationship between the stock market and the macroeconomic indicators in Namibia. In this chapter, literature, both theoretical and empirical, relating the stock market and the macro-economy is reviewed. Furthermore, the Autoregressive Conditional Heteroscedasticity (ARCH) model was adopted to assess for the presence of volatility in the stock market, since it is known to be volatile. Additionally, the Vector Error Correction Model (VECM) was constructed to test for the relationship between the macroeconomic indicators and the stock market in Namibia. The data sources and empirical results are also presented.

Chapter four presents the relationship between the foreign exchange market and the macroeconomic indicators in Namibia. Here the literature is reviewed, linking the macro-economy to the foreign exchange market. After presenting data and data sources, the Autoregressive Conditional Heteroscedasticity (ARCH) and the General Autoregressive Conditional Heteroscedasticity (GARCH) models were used to assess the presence of volatility in the foreign exchange market. Furthermore, the Error Correction Model (ECM) was applied to validate the short- and long-run relationship between the foreign exchange market and the macroeconomic indicators in Namibia. The empirical results of the models ran under this chapter are also presented here.

Chapter five represents the relationship between the housing market and the macroeconomic indicators in Namibia. In this chapter, literature about the relationship

between the housing market and macroeconomic indicators is reviewed, theorizing and quantifying the relation between the two. Furthermore, the Structural Vector Autoregressive Model (SVAR) was constructed and conducted to assess the relationship between the housing market and the macroeconomic indicators of Namibia. Thereafter, the data, data sources and the results of the model are presented.

Chapter six presents the conclusion of the study. Policy recommendations based on the findings of the study with suggestions for further research are also presented.

Chapter Two: An overview of Macroeconomic Indicators; the Stock Market; the Foreign Exchange Market and the Housing Market in Namibia

2.1 Introduction

This chapter contains a summary and analysis of the trend of the selected macroeconomic activity indicators in Namibia. It presents an overview of how Namibia has been performing domestically. The performance and the movements of the Namibian stock exchange market and the Namibian foreign exchange market along the Namibian housing market are presented in this chapter. The discussion of the three asset markets gives an overview of how the asset markets have been developing and performing in the observed time frame. Additionally, an overview of the Namibian financial sector is also presented, where the players in the financial environment are introduced alongside the monetary policy.

It is important to note that Namibia is part of the Common Monetary Area (CMA) together with Lesotho, Swaziland and South Africa. Although the CMA was established in 1986, Namibia only joined in 1992, after its independence in 1990 (Masha, Harris, Shirono & Wang, 2007; Seleteng, 2010). The CMA aims to promote economic development in member countries. Under the CMA the four economies agreed to peg their currencies to the South African rand of which the exchange is one to one. The currencies of Lesotho, Namibia and Swaziland (LNS) are legally tendered in their own countries only, while the South African rand is legally tendered throughout the CMA (Seleteng, 2010). Since the rand is traded in all the countries in the CMA, South Africa compensates the LNS

countries for the forgone profit they could have made by exchanging their respective currencies.

The South African economy dominates the CMA. Therefore, the monetary policies in Namibia depend on the policies decided by the South African Reserve Bank. Although there are times when the Bank of Namibia decides on policies to address domestic issues, inflation, interest rates and exchange rate policies are mostly influenced by the policies of the South African Reserve Bank. The Namibian macroeconomic environment can be influenced by the South African macro-economy through its monetary and exchange rate policies.

2.2 An Overview of the Trend Analysis for the Macroeconomic Indicators

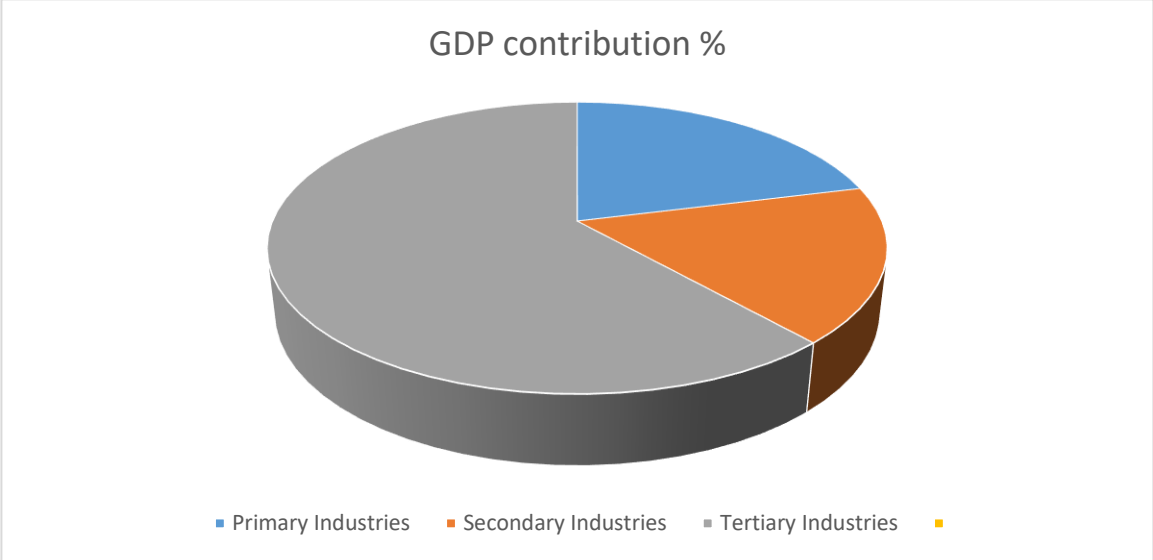
Macro-economics is defined as the overall performance of the aggregate economy (Parkin, 2014). This means that, for one to get an idea of how the overall economy is performing, specific indicators need to be observed. According to Parkin (2014), macroeconomic performance is reflected by factors such as gross domestic product, inflation, unemployment, monetary aggregates and interest rates, amongst others. It is with this view that the real gross domestic product, inflation, money supply, terms of trade, government expenditure, gross disposable income and investment are some of the macroeconomic indicators in the Namibian economy that are used to give an overview of the Namibian macroeconomic performance. As mentioned earlier, the Namibian economy is linked to that of South Africa due to historical ties. This is mainly because of the one to one peg of the Namibian dollar and the South African rand. Also, the Namibian economy depends heavily on the South African economy in terms of exports and imports. The macroeconomic activities in the Namibian economy are influenced by the economic

changes and political events or outcomes of South Africa. The selected Namibian macroeconomic activity indicators are presented below.

2.2.1 Real Gross Domestic Product growth

The first indicator is the real gross domestic product (RGDP). RGDP is similar to industrial production, and both are used as proxies of economic growth. Since before Namibian independence in 1990, the amount of RGDP produced in the Namibian economy has come from three major industries: the primary industry, the secondary industry and the tertiary industry. Most contributions to RGDP come from the tertiary sector in the Namibian economy as indicated by Figure 2.1 below.

Figure 2.1: Sectoral contribution to RGDP in Namibia (1995-2018)



Source: Author's computation using data from NSA

The tertiary industry contributed the largest portion to the economic growth of Namibia accounting for more than 1 370 per cent between 1995 and 2018. The high performance in the tertiary industry came from improvements in the wholesale and retail trade, repairs, real estate and business services together with producers of government services. In 1995 these three sectors contributed N$18.7 million to the tertiary industry, an amount that increased to N$22.1 million by the end of 2000. By the end of 2010, the three sectors contributed N$33.9 million to the tertiary sector.

By the end of 2016, the three sectors contributed more than N$49 million to the tertiary sector. The producers of the government services contributed to the biggest portion of N$25.7 million, which made up more than 50% of the overall sectoral contributions. The three sectors contributed a total sum of N$47 million by the end of 2018. This reduction in the total contribution came as a result of a fall in the wholesale and retail trade repair along with the producer of government services.

The primary industry contributed the second-biggest portion, accounting for more than 470 % of total RGDP growth between 1995 and 2018. This was mainly due to the good performance in the mining sector. The mining sector contributed the largest portion of all the sectors in the industry, rendering about N$1.4 million in 1989, before independence, with output as high as N$2.7 million by the end of 2000 (Bank of Namibia, 2000). In the years between 2001 and 2016, the mining sector contributed an amount between N$2.9 and N$18 million respectively, adding N$10 million and N$12 million in 2017 and 2018 accordingly.

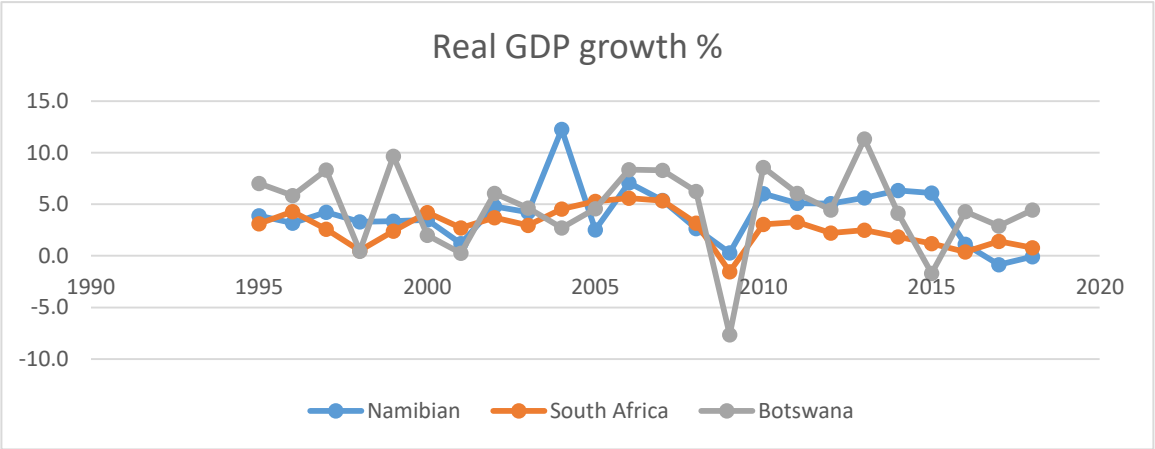
The secondary industry contributed the lowest portion to the growth of RDGP in comparison to the other industries. In total the secondary sector contributed about 38.5%

to RGDP growth between 1995 and 2018 according to the Bank of Namibia, (2018). Other manufacturing contributed the most in the secondary industry: N$ 5.1 million in 1995, an amount that increased to N$5.6 million in 2000 and later to N$9.9 million in 2010. By the end of 2016 other manufacturing contributed N$10.3 million to the secondary sector and more around N$10.5 million by the end of 2018.

The electricity and water sectors also contributed a fair share to the secondary industry between 1995 and 2018: N$2.4 million in 1995, an amount that increased to N$4.1 million by the end of 2010. By 2016, they contributed N$7.5 million to the secondary sector. This was mainly brought about an improvement in the electricity and water sector, which accounted for N$5.4 million. By the end of 2018, the electricity and water sector saw a downfall and contributed N$3.4 million, which is 37% less than in 2016. The construction industry contributed N$2.2 million in 2018.

Despite such contributions to RGDP, the Namibian economic growth fluctuated, increasing by huge margins in some years and falling by significant amounts in the other years as shown in Figure 2.2 below.

Figure 2.2: RGDP growth in Namibia, South Africa and Botswana (1995-2018)



Source: Author's computation using data from NSA and the World Bank

Before independence, GDP grew at an increasing rate until after independence where the Namibian economy saw an increase of 3.9% in GDP at the end of 1995. Between the years, 1997 and 2005, GDP started to fall between 2 % and 3.5% respectively, only to pick up again between 2010 and 2015, growing at 6% by the end of 2015. These fluctuations in GDP growth continued, and the Namibian economy realized a 1.1% growth rate at the end of 2016. The lowest growth recorded in Namibia occurred in 2017 and 2018 when the country showed negative growth rates of -0.9 and -0.1 respectively. This reduction in economic growth might have been a result of the negative contributions by the secondary and the tertiary sectors. The secondary sector contributed -6.7% and -3.4% in 2017 and 2018 respectively. The tertiary sector contributed less than -3% in both 2017 and 2018.

These fluctuations were brought about by all kinds of factors. For instance, there was an improvement in the GDP growth due to improvements in the global markets (Bank of Namibia, 1999). In other years, e.g., 2012, the global economy was recovering slowly from the slow growth experienced from the world's most dominant economies, and this improved the economic growth in Namibia (Bank of Namibia, 2002). Although GDP started to improve in 2005, it was doing so at a slow pace, which was brought about by a fall in productivity in the primary sector (Bank of Namibia, 2005).

In 2008, the world economy fell into a recession that was caused by the United States' housing in mid-2006. This recession created a low-interest-rate environment that saw a slowdown in most developing economies, and Namibia was no exception. The recession harmed the economic growth of Namibia caused by the exchange rates and commodity prices (Bank of Namibia, 2008). Since the Namibian economy was open and traded with

the rest of the world, the export-oriented industries suffered the most, especially the mining sector. It is important to note that changes in the economic growth in Namibia depend on the output of the three sectors in the economy. The mining sector experienced unemployment during this recession that increased the overall unemployment rate and reduced economic growth in Namibia between 2006 and 2009 (Bank of Namibia, 2009). After the recession, the global economy recovered at a slow pace. In 2012, the Namibian mining sector started picking up, improving economic growth by 4.6 % by the end of 2012 (Bank of Namibia, 2012).

By the end of 2017, most of the world dominant economies, such as China and the United States as well as the Euro Area were expanding slowly. According to the Bank of Namibia (2017), the Namibian economy was weak due to slow growth from the secondary and tertiary sectors. This brought a contraction of the economy by 0.1% at the end of 2017. All these indicated that the Namibian macroeconomic activities had been fluctuating through GDP growth, employment and exchange rates.

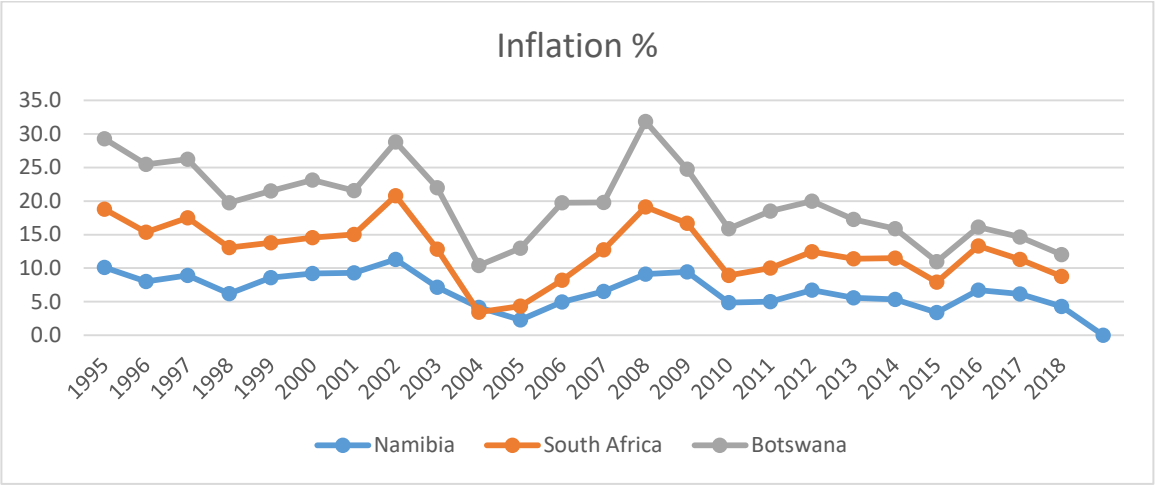
The Namibian economy was doing quite well. As indicated in figure 2.2, the Namibian economy was moving near the neighbouring more-developed economies such as South Africa and Botswana. In the years, 1998, 2004, 2009 and 2012, the Namibian economy had been growing more than the South African and Botswana economy. The same can be seen for the years 2014 and 2015.

2.2.2 Inflation

Macroeconomic activities can also be reflected through inflation. Inflation measures the value of money in an economy and thus the purchasing power of the society. The inflation

rate was fluctuating in Namibia. It was as high as 11% in the 90s, only to be reduced to 4.3% by the end of 2018. The inflation trend in Namibia is shown in Figure 2.3 below.

Figure 2.3: Inflation in Namibia, South Africa and Botswana (1995-2018)



Source: Author's computation using data from Bank of Namibia

The Namibian economy's inflation was higher than 10% after independence, recording 10.8 % by the end of 1992. By the year, 1997, that figure fell to 8.9 % only to pick up later to 11.3% by the end of 2002. Inflation decreased between 2003 and 2005. It was recorded at 5% by the end of 2005 only to pick up to 9.5% by the end of 2009. This was the highest inflation recorded in Namibia between 2003 and 2018. It continued to fluctuate at a decreasing rate between 2010 and 2016, falling between 3% and 6%. By the end of 2017 inflation in Namibia stood at 6% but fell to less than 4.4% in 2018.

Namibia's inflation rate has been low in comparison to some of its neighbouring economics e.g., Angola and Zimbabwe that, according to the World Bank (2017), saw inflation rates above 100%. Namibia was better off because it was part of the CMA.

According to Seleteng (2010), one of the aims of the CMA was to promote price stability. This saw inflation declining in the CMA member countries.

Figure 2.3 indicates that the inflation rate in Namibia was lower than that of South Africa and Botswana. Although it was moving parallel to that of South Africa, inflation in Namibia was relatively low in comparison to that of Botswana between 1995 and 2018. The similarities in the trend of inflation between Namibia and South Africa might also be attributed to the fact that the Namibian economy is closely linked to the South African economy.

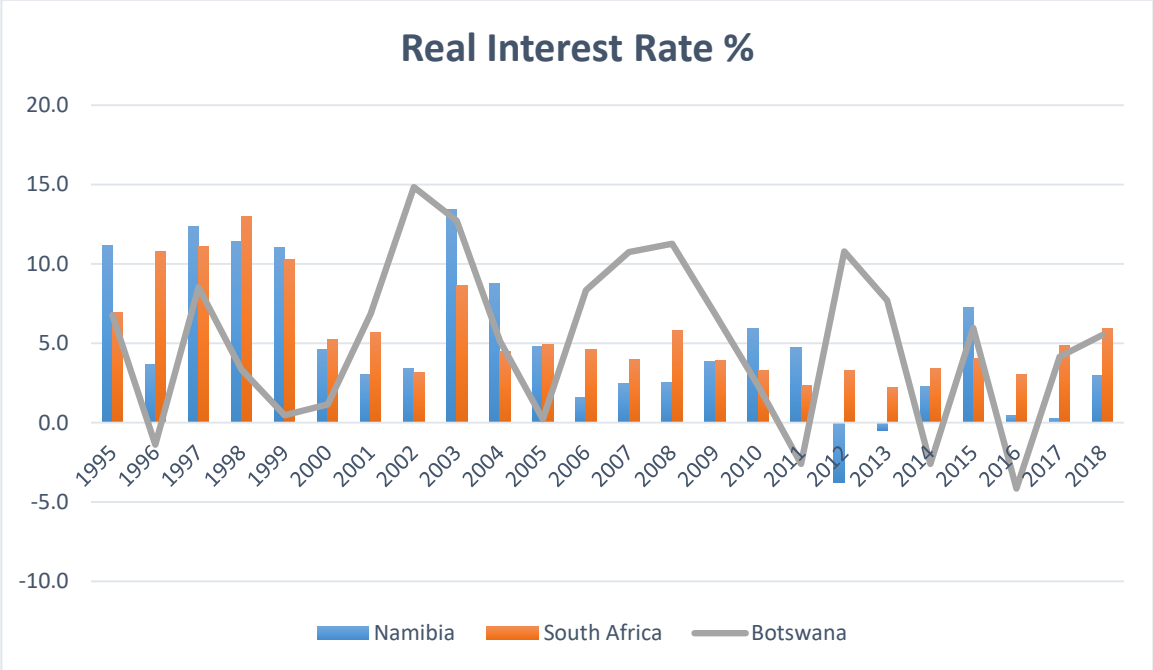
Most of the goods and services consumed in Namibia are imported from the South African economy, therefore the economic environment between the two is similar. In 1999 the Namibian economy improved, and inflation fell to 8 % by the end of 1999 (Bank of Namibia, 1999). The improvement was short-lived. At the end of 2002 inflation accelerated to 10.3 % in comparison to 9.3% in 2001 (Bank of Namibia, 2002). During the financial crisis of 2008, inflation increased and was 11.3% at the end of 2008 (Bank of Namibia, 2008).

After the 2008/2009 global financial troubles, the inflation rate in Namibia fell to single digits that were an improvement. In 2012 inflation stood at 6.5%, an increase from 5% in 2011. This increase was influenced by inflation in the food and transport inflation (Bank of Namibia 2002). By the end of the year 2017, reports by the Bank of Namibia (2017) indicated that Namibia experienced a fall in housing inflation, which resulted in the reduction of the overall inflation.

2.2.3 Interest rate

The interest rate in Namibia is important to economic activities because the central bank uses it as a policy instrument. The real interest rate adjusts in response to changes in the repo rate, which is one of the monetary policy tools used by the Bank of Namibia. Since Namibia is part of the CMA, the real interest rate has been low in comparison to neighbouring countries such as Botswana most of the time. Real interest rates in Namibia, South Africa and Botswana are shown in Figure 2.4 below.

Figure 2.4: Real Interest Rates in Namibia, South Africa and Botswana (1995-2018)



Source: Author's computation using data from the Bank of Namibia and the World Bank Database

Real interest rates in Namibia have been fluctuating between 14% and -3% between 1995 and 2018, as shown in figure 2.4. In 1995 the real interest rate was somewhat above 11%, only to fall to less than 4% by 1996. By 1997 it increased rapidly to above 12%, only to

decrease at a diminishing rate between 1997 and 1999 and to fall again to less than 4% between 2000 and 2002. According to the Bank of Namibia (2002), the central bank tightened the monetary policy in 2002 increasing interest rates to reduce credit availability.

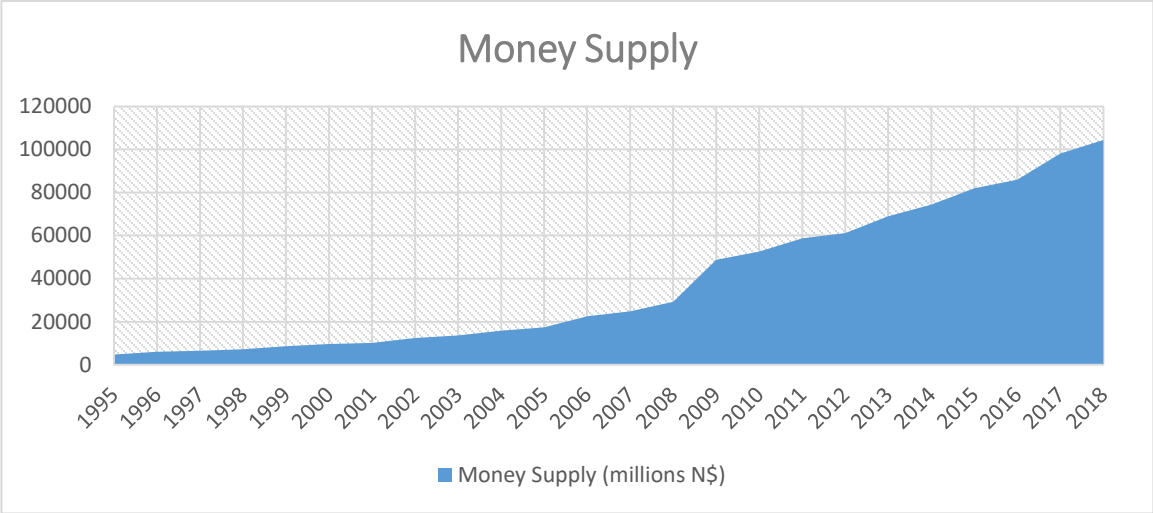
In 2003 the real interest rate recorded the highest rate of 13.4%, after which it fell sharply to 1.6% by the end of 2006. During the world financial instabilities of 2008/2009, the real interest rate ranged between 2% and 4%. The real interest rate recorded the lowest percentage in 2012 and stood at -3.7% only to shoot up to 7.2% by the year, 2015. In 2016 the real interest rate stood at 0.4% but increased to 3% at the end of 2018.

The real interest rate in Namibia was fluctuating in an almost similar trend to that of South Africa, as shown in figure 2.4 above. This is the result of the closeness of the Namibian economy to that of South Africa. The monetary policy implemented by the Bank of Namibia depends on the monetary policy implemented by the South African Reserve Bank. It is only fair that the real interest rates in the two economies follow a similar trend.

2.2.4 Money supply

The money supply is another indicator of macroeconomic activities. Money supply in Namibia increased at a slow pace between 1995 and 2016 as shown in figure 2.5.

Figure 2.5: Money supply in Namibia between 1995 and 2018



Source: Author's computation using data from Bank of Namibia

The money supply increased at an almost constant rate between 1995 and 2000. According to the Bank of Namibia (1999) in 1999, the money supply increased due to an increase in credit availability to domestic agents. The money supply increased above N$10000 million in 2001 and even further to above N$20000 million in 2006. In 2008 money supply increased to 17.9% from 10.1% in 2007 (Bank of Namibia, 2008). It increased sharply, recording above N$50000 million at the end of 2009.

Money supply started contracting after the financial crisis and stood at 6.1% by the end of the year, 2012. According to the Bank of Namibia (2012), this slow growth in the money supply was a result of the contraction in the net foreign assets in the banking sector of Namibia. Money supply continued to increase after that, and it stood at more than N$80000 million by the end of 2016. In 2017 Namibia experienced a fall in housing inflation, which resulted in the reduction of the overall inflation. This, according to the

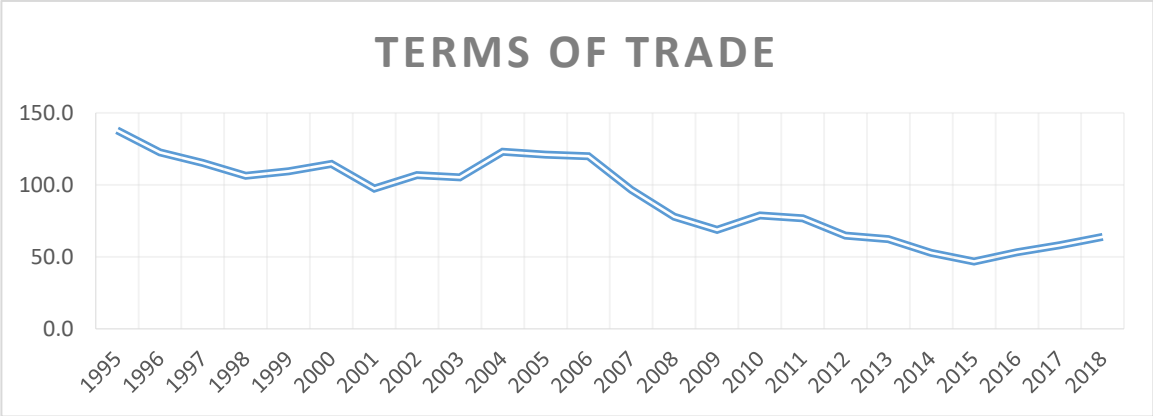
Bank of Namibia (2017), diminished demand for money and in return slowed the growth of the money supply to 6.4% at the end of 2017. The money supply was more than N$100 000 million by the end of 2018.

2.2.5 Terms of Trade

Since Namibia is an open economy, the volumes of trade reflect the macroeconomic activities, especially through the exchange rate market. One of the goals of the CMA is to facilitate trade in the region (Seleteng, 2010). Namibia exports natural resources such as fish and crustaceans, ore, diamonds and other precious materials (Namibian Statistics Agency, 2017). Most of the Namibian exports go to South Africa and Botswana. By the end of 2017, 24% of exports went to South Africa, while Botswana received 13%. The rest went to Switzerland, China, Belgium, Spain, the UAE, Italy, Zambia and France (Namibia Statistics Agency, 2017).

Due to the lack of oil resources, Namibia fully depends on import for all its fuel needs. The largest portion of imports is mostly made up of mineral fuels and oils. Namibia also has a small manufacturing base, and it is an importer of manufactured products as well. According to the Namibian Statistics Agency (2017), by the end of 2017, South Africa accounted for 56% of imports in Namibia. Bulgaria and Botswana accounted for more than 6%, while China, Zambia, India and others accounted for less than 5%. Imports outweighed exports in Namibia, thus the trade balance was in deficit most of the time. A trade balance surplus was experienced in 2008, after which the economy had been operating with a trade deficit up to 2017 (Namibian Statistics Agency, 2017). The terms of trade are represented in Figure 2.6 below.

Figure 2.6: Terms of Trade in Namibia, 1995-2018



Source: Author's computation using data from NSA

Terms of trade in Namibia were falling at a diminishing fluctuating rate between 1995 and 2015 as indicated in figure 2.6 above. It recorded nearly N$140 million in 1995, an amount that decreased to nearly N$100 million at the end of 1998. Trade amassed, and it increased at an almost constant rate between 1998 and 2000, only to fall sharply to less than N$100 million by the end of 2001. It picked up again and increased between 2001 and 2002, then fell again by 2003. It was almost constant between 2004 and 2006, near an amount of N$120 million.

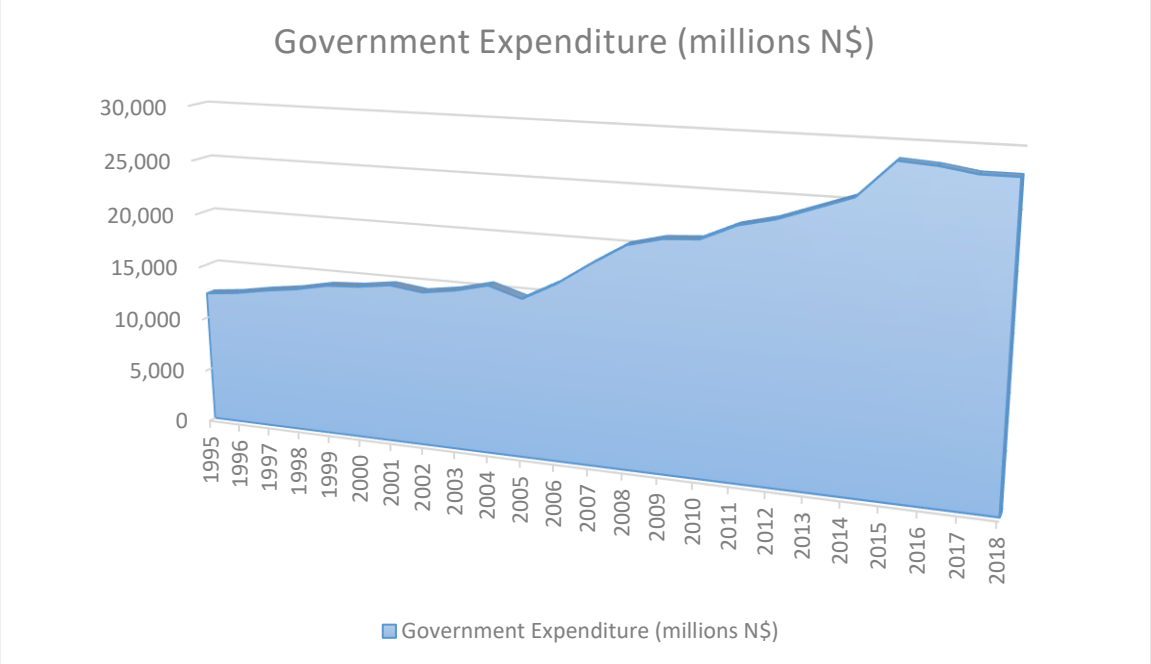
During the world financial crisis of 2008/2009 trade fell drastically, standing at almost N$70 million by the end of 2009. This was expected since there were economic instabilities in the world. Between 2010 and 2012 trade picked up, increased at a decreasing rate, moving between N$78 and N$76 million accordingly. It fell to about N$47 million by the end of 2015, only to pick up to more than N$50 million by the end

of 2016. Terms of trade continued to improve in 2017, standing at N$58 million, an amount that increased further to more than N$60 million by the end of 2018.

2.2.6 Government Expenditure

Government expenditure can also be used as an indicator of macroeconomic activities, especially when the economy depends heavily on it. Namibia depends heavily on the government for most services, and thus government expenditure indicates the macroeconomic activities. Figure 2.7 below indicates the trend of government expenditure in Namibia between 1995 and 2018.

Figure 2.7: Government Expenditure, 1995-2018



Source: Author's computation using data from NSA

Figure 2.7 above indicates that the government expenditure in Namibia had been increasing over the years, and more than doubled at the end of 2016. In 1995 government

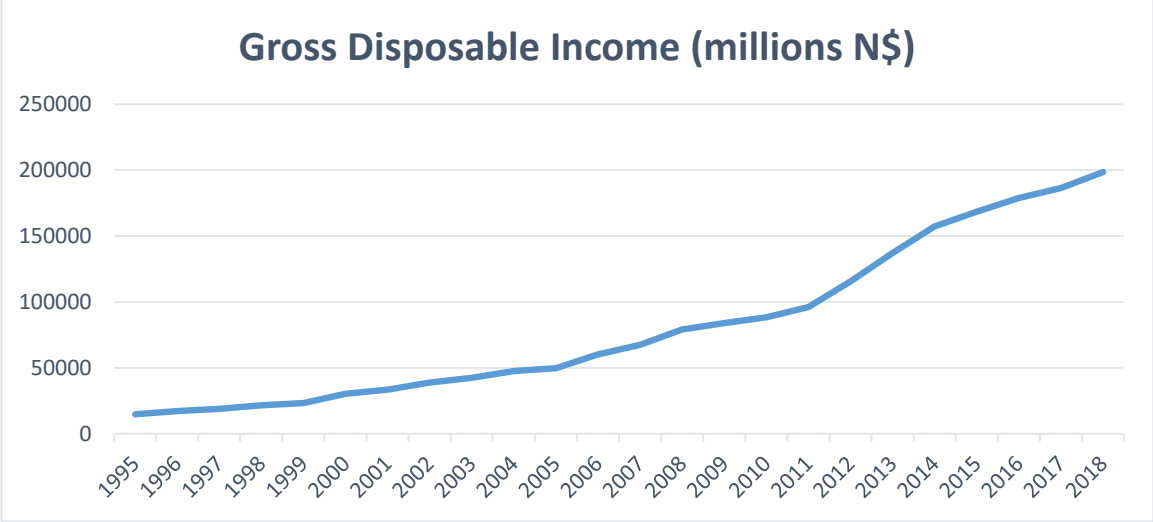
expenditure stood at around N$12000 million, an amount that expanded to nearly N$14000 million by the end of 1999. By the end of 2001, the government expenditure further increased to N$14725 million, falling to N$14309 million in 2002, only to increase again to N$14796 by the end of 2003.

It increased after that, reaching more than N$15000 million by 2004. This amount later fell in 2005 to N$14600 million, then picked up again to more than N$16000 million by 2006. From 2007 onwards, government expenditure increased, even during the 2008/2009 financial instabilities. By the end of 2010 government expenditure increased to more than N$21000 million, recording the highest amount of N$28000 million in 2015 and 2016. In 2017/2018 the ministry of finance announced a fiscal policy contraction by reducing government expenditure. This saw government expenditure falling to N$27 000 million in 2017 and 2018.

2.2.7 Gross Domestic Disposable Income

Another macroeconomic activity indicator is disposable income. This refers to the amount of money the economic agents have at their disposal. Disposable income indicates the purchasing power of the economic agents through spending. This in the end reflects productivity, employment as well as economic growth. Gross disposable income in Namibia increased between 1995 and 2018. This is no surprise given that the money supply in Namibia was increasing, as indicated in figure 2.5. An increase in the money supply increases the availability of funds to economic agents. This in return increases disposable income, which in the process increases consumption. The Namibian gross national disposable income is shown in Figure 2.8 below.

Figure 2.8: Gross National Disposable Income, 1995-2018



Source: Author's computation using data from Bank of Namibia

The trend of gross disposable income in Namibia is almost similar to the one of the money supplies, increasing at a slow pace. Between 1995 and 1997 the national disposable income was under N$20000 million, only to increase above N$20 000 million in 1998. In 2000, the gross disposable income was more than N$30 000 million, an amount that increased to more than N$47 000 by the end of 2004. It continued to increase between 2005 and 2006, ranging between N$49 000 and N$60 000 million,

There was a sharp increase in the gross disposable income between 2007 and 2008, then it started to move in an almost constant trend between 2008 and 2011. This increase in disposable income might have been triggered by the 2007/2008 financial crisis. During this period inflation jumped from 6.6% to around 9.9%. This increase in the price levels

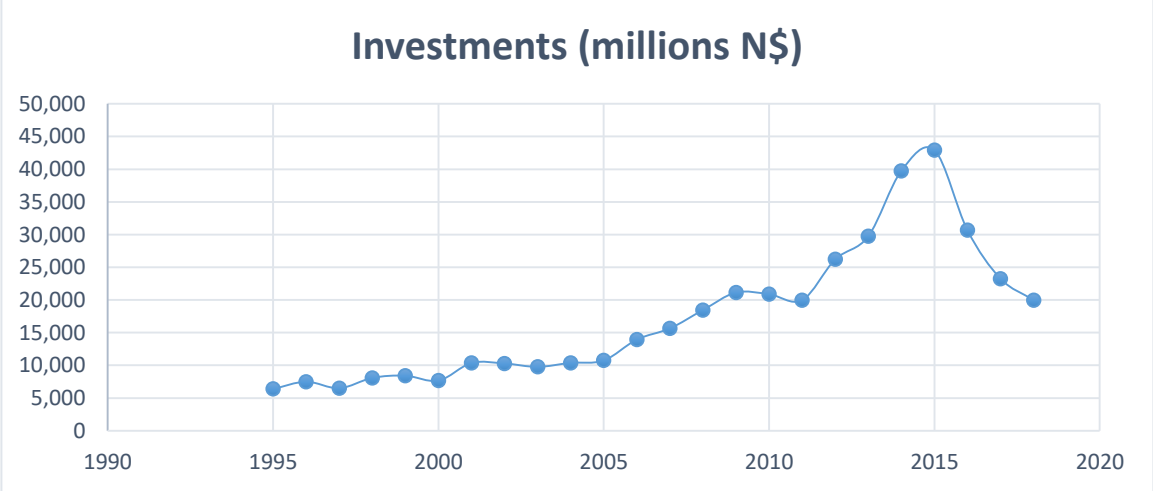
might have increased disposable income. It continued to increase sharply between 2011 and 2013, ranging between N$96 000 and N$137 000.

In 2014, the Namibian ministry of finance implemented a fiscal policy expansion. Tax relief was given to the economic agents in Namibia. This increased the amount of disposable income to more than N$20 000 million, and it stood at N$157 000 by the end of 2014. Gross disposable income continued to increase by more than N$10 000 between 2016 and 2017. It stood at the highest amount of more than N$198 000 by the end of 2018.

2.2.8 Investment

Investment determines the level of macroeconomic activities. An increase in investment increases the productivity of the economy, which increases the gross domestic product. Investment in Namibia increased at a fluctuating rate between the years 1995 and 2018, as shown in Figure 2.9 below.

Figure 2.9: Investment in Namibia, 1995-2018



Source: Author's computation using data from NSA

The level of investment was lower than N$10000 million between 1995 and 2000, as indicated in Figure 2.9. Despite this, it increased at an almost constant rate between 2001 and 2005, to around N$10000 million. It started to pick up slowly by the end of 2006, standing at more than N$13 000 million.

Investment fell in 2011, then picked up again in 2012. It accounted for more than N$29 000 million by the end of 2013. In 2015, investment recorded its highest amount of N$42 000 after which it started to decrease. It continued to fall between 2016, 2017 to 2018 when it recorded less than N$20 000 million.

The figure presented above indicates that macroeconomic activities in Namibia have been fluctuating. Some of the indicators show an increase over time, some show a decrease over time. Some indicators show fluctuations, while some seem to almost move in a constant trend. These movements in the macroeconomic activities in Namibia might be attributed to the changes in the financial/asset markets, and that is what this study intended to investigate.

2.3 An Overview of the Namibian Stock Exchange Market

2.3.1 Establishment and Development of the Namibian Stock Exchange Market

One way to bring about economic development is through capital accumulation that involves investment, a process that is easier done through a stock market. The first stock exchange market in Namibia came into existence in 1904, only to shut down in 1910 (Bahabwa, 2015; Katoma, 2013). After independence in 1990, the current Namibian Stock Exchange Market (NSX) was established in 1992. Although it started with one dual listed company, as well as one stockbroker, it aimed at providing a platform for fund mobility

and capital investment (Bahabwa, 2015). The Namibian Stock Exchange is the only market licensed to trade stocks, and it is licensed according to the Stock Exchange Control Act (No.1 of 1985) as stated by (Katoma, 2013 and Bahabwa, 2015).

Unlike other stock markets, the NSX is not a profit-making entity; its sole purpose is to encourage economic development in the Namibian economy. It is aimed at creating a platform where Namibian companies can trade their capital goods and bring in capital inflows. Upon its establishment, the NSX had a market capitalization valued at N$10 million and 60 companies listed on its main board and the capital development board, out of which 6 were domestic companies, whilst 27 were dual-listed (Katoma, 2013).

This NSX has developed over the years since its establishment in 1992. According to Matthys (2017), the NSX started with four companies listed, but the number had increased to 43 companies by the end of 2017. Even the market capitalization has improved from N$8.6 million in 1992 to N$1.8 trillion by the end of 2017. The NSX also funded projects together with the Bank of Namibia. It developed the Namibian capital market, by attracting participants. It also exposed the Namibian capital market to larger international investment pools that deepened investment in Namibia (Namibian Statistics Agency, 2015). The NSX also provided funding to educational institutions such as the University of Namibia through its NSX scholars challenge (Matthys, 2017).

2.3.2 Structure of the Namibian Stock Exchange Market

The structure of the Namibian Stock Exchange Market is made up of two major parts: the organizational level and the operational level. The organizational level is made up of 42 founding members, who donated N$ 10 000 each. The board that is chaired by a chairman

and has nine members from the business community, influences the operational decisions. Furthermore, the board operations require a 10^{th} attendee representation by the Namibian Financial Institution Supervisory Services (NAMFISA).

The operational level consists of the Namibian Stock Exchange and the Transfer Secretaries (Pty) Ltd that are regulated and annually licensed by NAMFISA. The Namibian Stock Market has a set of requirements for a firm to be listed. According to Bahabwa (2015), the firm is required to have equity shares of N$1 million, it should have a minimum of 1 million shares in issue, and it must have a trading profit record for three years. Moreover, the public should own a minimum of 20% of the shares. Also, before tax and interests, the firm should have an audited profit of at least N$500 000 on an annual basis. To add, the firm must have a minimum of 150 shareholders, and it must at least provide the record of audits for the past three years. Finally, the firm should have an acceptable record of good business practice and integrity.

2.3.3 Promotion of Stock Exchange

The Namibian Stock Exchange is relatively small in comparison to other stock exchanges such as the Johannesburg Stock Exchange. Moreover, it is hard to turn assets into cash fast because of the improper infrastructure. Despite these shortcomings, the Namibian Stock Exchange has contributed its fair share in promoting growth, both for business and for the Namibian economy in general. Although it adopted automation by using the trading system used by the Johannesburg Stock Exchange, there is a need to increase innovations in other areas.

Bahabwa (2015) stated that there is a need for innovations such as the demutualization of exchanges in the Namibian Stock Exchange Market. The idea here was to make the Namibian Stock Exchange a profit-oriented organization, which would contribute a lot to the economy in terms of finance, whenever the Stock Market makes a profit. Furthermore, regional integration regulatory and supervisory improvements, as well as the promotion of investors in the stock market, might also improve the Namibian stock exchange, Yertey and Adjasi (2007) as cited in (Bahabwa, 2015).

Bahabwa (2015) also stated that there was a need for involving foreign investors as well as educational programs. Foreign investors might bring in funds to the Namibian Stock Exchange and other financial opportunities and platforms, which could be beneficial. Financial education was important as well. Educational programs would make the economic agents aware of the financial assets and the trading outline of the stock market. This would increase the volume of participants in the stock market, which would improve the Namibian Stock Market.

Namibia is linked directly to the South African economy and has a direct monetary linkage to the South African economy through its membership in the Common Monetary Area (CMA) (Namibian Stock Exchange, 2012). Securities on the Namibian Stock Exchange Market primarily consist of dual listed South African companies and Namibian companies. Although it mainly trades in long- and short-term securities, financial securities such as bonds and equities are also traded on the Namibian Stock Market. The Namibian Stock Exchange Market oversees and regulates the trading activities of its members. Furthermore, it publishes general information about the Stock Exchange Market as well as stock trading information. Because of this linkage, the NSX runs a dual listing

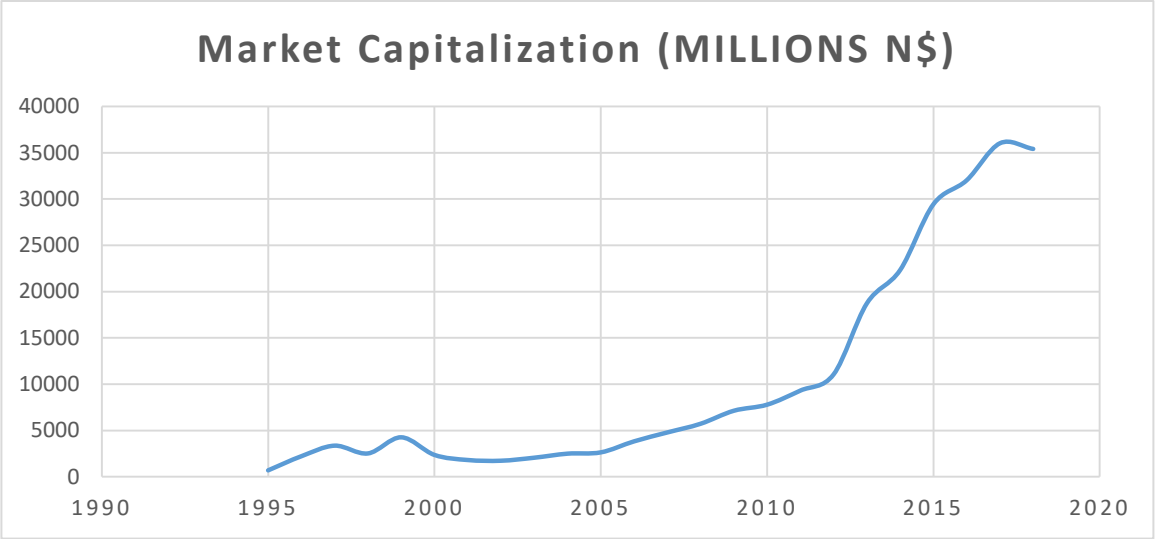
operation, having companies listed on both the NSX as well as the Johannesburg Stock Exchange Market and moved almost in the same trend.

At the end of 2011, the NSX was one of the stock markets with a high market capitalization in Africa, right behind the JSE (Namibian Stock Exchange, 2011). According to Eita (2012), the NSX has been performing significantly ever since its establishment. The NSX realized and increased in market capitalization, increasing from N$10 million since establishment to N$337 million at the end of 2000. By 2009 the amount of market capitalization had increased to N$1024 billion, an amount which increased to N$1148 billion by the end of 2011 (Namibian Stock Exchange, 2011).

The number of local shares has improved between 1995 and 2018. These improvements in the NSX can be explained by improvements in the JSE since they are linked. According to the Namibian Stock Exchange (2012), the JSE upgraded its trading platform in 2012, and these improvements reflected in the NSX through an increase in income revenue.

The NSX enjoys the benefit from the pension funds and the insurance companies in Namibia that are required to invest 35% of their assets in the NSX. Furthermore, the NSX saw an increase in companies listed on their mainboard and development capital board, standing at 70 companies in 2012, increasing to 75 companies at the end of 2017. Although the NSX was doing well, it saw a reduction in revenue and the overall comparative trade now and then (Namibian Stock Exchange, 2017). Furthermore, in 2014, only 25% of the value dual-listed was from the Namibian registered assets. According to the Namibian Stock Exchange (2017), this amount fell by 10% at the end of 2017, in comparison to the 5% points in other years. The local share of market capitalization had been increasing over time between 1995 and 2018, as seen in Figure 2.10 below.

Figure 2.10: Local Share of the Market Capitalization (1995-2018)

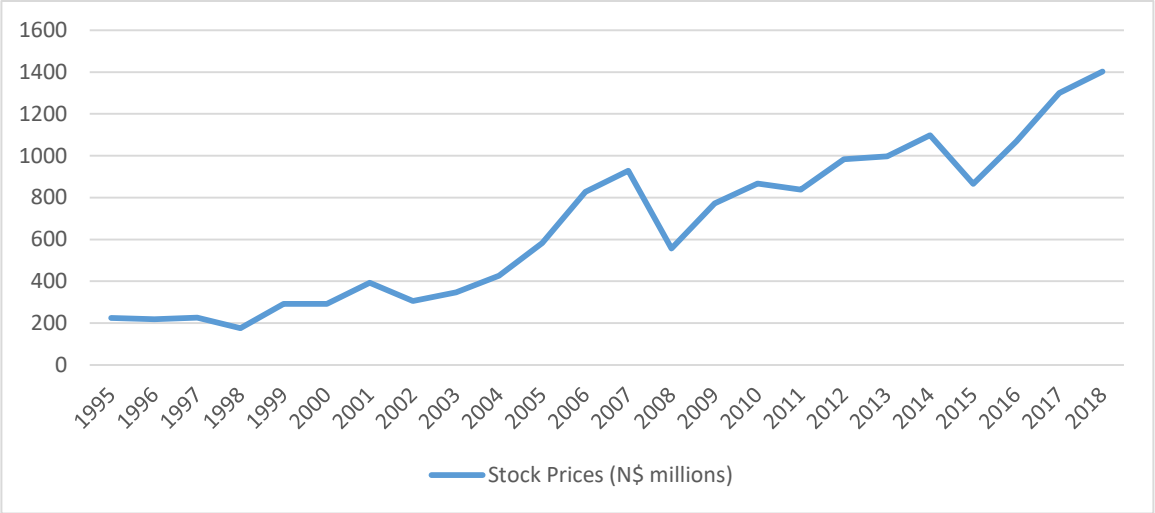


Source: Author's computation using data from NSX

The local share of the market capitalization was increasing as indicated in Figure 2.10. In 1995 it stood at less than N$700 million, an amount that was more than doubled by the end of 2000. Local share further increased at a doubling rate between 2006 and 2010, standing at more than N$7000 million by the end of 2010. Due to improvements in the NSX, the local share was more than N$29 000 million in 2015, after which it continued to increase. The local share was N$35 406 million by the end of 2018.

The NSX overall index fluctuated at an increasing rate between 1995 and 2019. The free-floating market capitalization weight index of all the firms listed in the NSX. It increased with the market capitalization, as indicated in Figure 2.11.

Figure 2.11: The Overall Index of the Namibian Stock Exchange Market (1995-2018)



Source: Author's computation using data from NSX

The overall index was fluctuating below 500 points between 1995 and 2004. It picked up in 2005 after which it started to increase at an increasing rate to above 500. In 2014 it was operating above 1000 points only to fall to 865 points at the end of 2015. By 2016 it picked up again and increased to above 1000 points, and it continued to increase until 2018.

2.4 An Overview of the Namibian Foreign Exchange Market

The Namibian Foreign Exchange Market is another important financial asset market. This is the marketplace where one currency is traded for another. Currency is traded at an exchange rate that is the price of currencies (Parkin, 2014). The exchange rate depends, amongst other things, on the type of exchange rate regime an economy adopts. Some economies adopt the fixed exchange rate, whilst others adopt a flexible exchange rate system. When Namibia obtained its independence in 1990, it adopted a fixed exchange rate regime (Bank of Namibia, 1990).

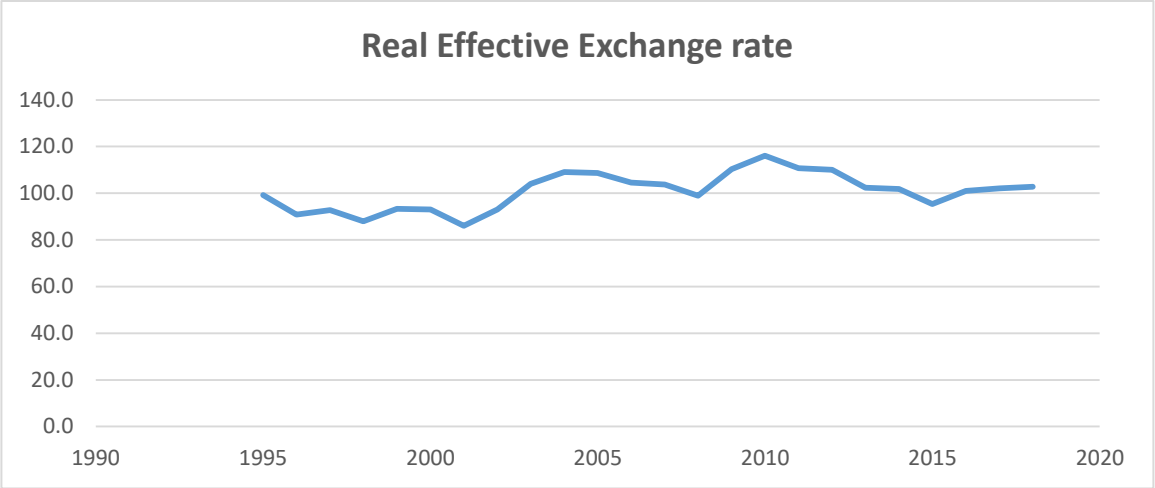
Since Namibia is part of the CMA that is dominated by the South African economy, exchange rate policies in Namibia have depended on those of South Africa. Since 1990 the rand has been depreciating, especially in comparison to some of the world's strong currencies such as the US dollar. According to Mudenda and Sherbourne (2001), in 1990, one would give up more than R2.5 for one US dollar, an amount that increased to more than R8 by the end of 2001.

The Namibian currency continued to depreciate against the US dollar long after 2001. According to the Bank of Namibia (2006), on average, the Namibian dollar depreciated at 5.5% against the US dollar. The general idea was that this was due to an increase in the demand for the rand. The increase in the rand came into play due to the widening of the merchandise trade deficit in the South African economy (Bank of Namibia, 2006).

After the financial instabilities of 2008, the Namibian dollar appreciated. According to the Bank of Namibia (2009), prices of minerals such as gold and diamonds saw a rebound, pushing the Namibian dollar to appreciate against the US dollar during 2009 compared to 2008. This appreciation was not long-lived. By 2012, the Namibian dollar was again weaker than the US dollar, depreciating at an average of 13.2% according to the Bank of Namibia, (2012). This depreciation of the Namibian dollar persisted, averaging at 16.5% against the US dollar by the end of 2017 (Bank of Namibia, 2017). By the end of 2018, the Namibian dollar depreciated further, trading for N$14.2 against 1 US dollar.

These fluctuations in the Namibian dollar can be explained by the fluctuation in the real exchange rates, which is the rate at which the Namibian dollar is traded in the foreign exchange market. The real exchange rate is presented in Figure 2.12 below.

Figure 2.12: Real Exchange Rates in Namibia (1995-2018)



Source: Author's computation using data from Bank of Namibia

As shown in Figure 2.12, the real exchange rate in Namibia fluctuated below 100 points between 1995 and 2002, only to go above 100 points after 2003. Real exchange rates started to fall again after 2004. It continued to fluctuate under 100 points between 2005 and 2008. By 2009 the real exchange rate was 110 points and it continued to increase to 116 points by the end of 2010. Between 2011 and 2012 the real exchange rate moved at an almost constant rate, only to start falling in 2013 until 2015 when it fell to 95.4 points. In 2016 it picked up again and increased to an almost constant pace to 102 points between 2017 and 2018.

2.5 An Overview of the Namibian Housing Market

The housing market is another important asset market in the Namibian economy because it contributes to the volume of investment in an economy (Sunde & Muzindutsi, 2017). Unlike other asset markets, the housing market poses challenges, especially to

policymakers. This is most likely because Namibia inherited a racially segregated and unequal housing market (Remmert & Ndhlovu, 2018).

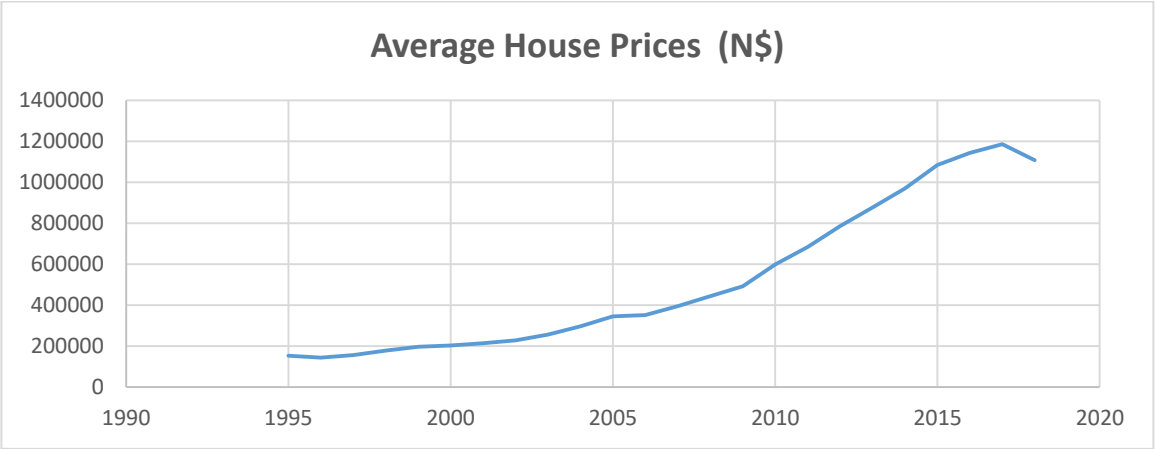
According to Mwilima, Fillipus and Fleermuys (2011), the Namibian housing market faced imbalances between the demand and the supply of houses. Over the years, urban migration has been increasing, individuals moved from villages and their hometowns to urban areas looking for green pastures. This move increased the level of unemployment in urban areas. Besides, urban areas saw an increase in informal settlements, increasing from 10% in the 90s to 17% at the end of 2004. Urbanization to the capital city, in particular, has increased by more than 4% each year, between 1996 and 2006 (Mwilima *et al*., 2011).

Although it is not easy for policymakers to deal with most of the challenges the housing market faces, there are some initiatives that the Namibian government and entities put in place to tackle the shortfalls in the housing market. The government-introduced initiatives such as the Build Together Programme (BTP), the National Housing Enterprise (NHE) and the central government initiatives, all aimed at reducing the gap between the demand and the supply of houses in Namibia (Mwilima *et al.*, 2011). Another initiative in place was the Shack Dwellers Federation of Namibia (SDFN), a non-government initiative by members of the public. The SDFN helped members to obtain land and infrastructure for housing purposes (Mwilima *et al*., 2011).

The high earners in Namibia bought properties for speculation. These speculative motives widened the gap between the demand and the supply of houses and in return increased the house prices. Because of urban migration and the speculative motives of the high earners

in Namibia, the demand for houses started increasing faster than the supply of houses. This is the process increased the prices of the houses, as shown in Figure 2.13 below:

Figure 2.13: The Average House Prices between 1995 and 2018

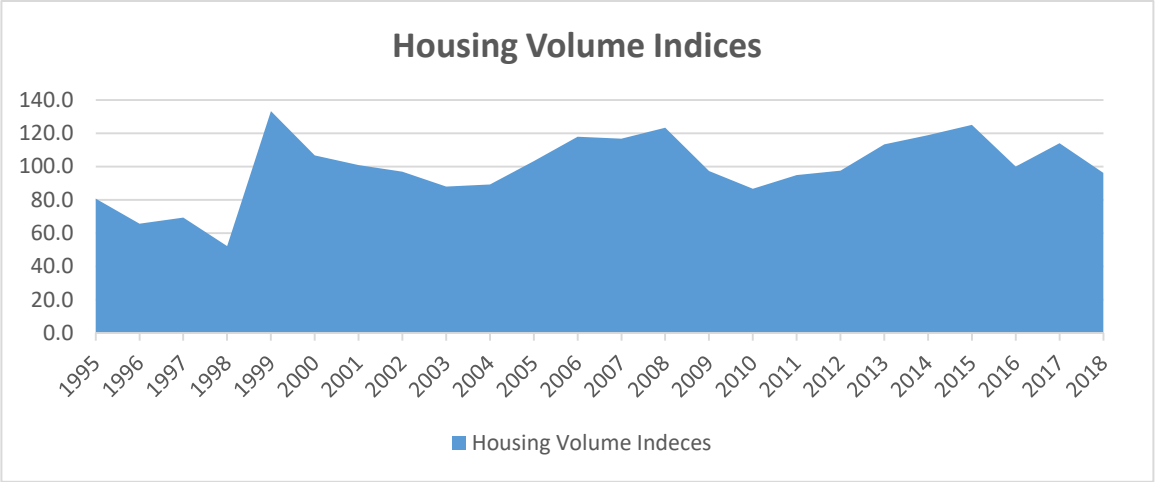


Source: Author's computation using data from First National Bank of Namibia

On average, the overall house prices in Namibia increased between 1995 and 2018. In 1995 the house prices were less than N$154 000, an amount that increased by more than N$50 000 by the end of 2000. By 2010 house prices more than doubled, standing at more than N$590 000. The house prices in Namibia continued to increase between 2011 and 2015. In 2016 the average price of a house in Namibia was more than N$1 140 000. It continued increasing in 2017 only to fall to N$1 108 500 by the end of 2018.

Despite the house price increase, the house volume fluctuated in the range of 52 and 133 between 1995 and 2018. Shortage of houses and delivery of housing were issued in Namibia since independence (Kaulihowa & Kamati, 2019). The housing volume in Namibia is shown in Figure 2.14 below.

Figure 2.14: The Namibian Housing Volume (1995-2018)



Source: Author's computation using data from First National Bank of Namibia

In 1995 the volume of houses delivered in Namibia was 80.7 on average, a number that increased to more than 90 in 1996. The volume was almost constant between 1996 and 1998, only to increase to 133 in 1999. This was the year the highest volume of houses was allocated. The volume started falling from 2000 until 2004. It later picked up in 2005 and continued to increase until 2008 with a record number of 123. This was short-lived, as the volume of houses started to fall from 2009 to 2011. In 2012 it picked up again until 2015 only to start falling in 2016. The volume increased in 2017 and fell to 96 in 2018.

Also, an increase in the housing prices against a small volume of houses led to an increase in the rent prices in Namibia. With an increase in the house prices against the supply of houses, most households were pushed to rent due to their inabilities to buy properties. This move increased the demand for rental properties, in the process increasing the rental price as well. The rental price more than doubled between 2005 and 2011 and continued to increase at a fluctuating rate (First National Bank, 2015).

Even the rental payments for dwellings for renters fluctuated. According to the Bank of Namibia (2018), rental payment was about 5% of the average house prices in 2012. This amount fell to less than 2% between 2013 and 2015, only to pick up to 7% by the end of 2016. It further increased to 9.6% in 2017. By the end of 2018, rental payment for dwellings was at 2.2%.

2.6 An Overview of Namibia's Financial Sector

In most emerging economies, there is a limited degree of participation by domestic firms and households (Epstein & Shapiro, 2017). Epstein and Shapiro (2017) narrated that the unwillingness of domestic participation by firms makes the domestic financial systems less competitive and vulnerable to foreign financial shocks. Namibia is no exception, being a small developing economy. Although this is the case for most emerging economies, Namibia has enjoyed a stable financial sector in comparison to most African economies.

In any economy, most financial decisions are influenced by the central bank. The Bank of Namibia (BON) came into existence in 1990, through the BON Act. No.8 of 1990. The sole purpose of the BON was to promote economic development through financial stability. It acted as a regulator of the depository institutions in Namibia. According to Mushendami (2007), the Namibian economy adopted a dual financial system after independence. This dual financial sector has two branches: a formal section and an informal section. The formal branch of the financial system is made up of the central bank, the Bank of Namibia, the commercial banks, insurance companies, pension funds, asset management companies and the stock market, while the informal section of the financial

market consists of micro-lenders. First, the formal section of the financial market is discussed, then the informal section.

2.6.1 Commercial banks

Namibia has a well-developed commercial bank environment in terms of infrastructure and institution. According to Sheefeni and Nyambe (2016), the Namibian financial sector was dominated by commercial banks. Namibia had four major banks by December 2013 (Bank of Namibia, 2014). Before independence, Namibia had seven banks (Sidano, 2009). By the end of 2016, Namibia had nine fully-fledged commercial banks (Paavo, 2017). These nine banks were reduced to eight commercial banks by the end of 2018 (Bank of Namibia, 2018).

Most of the commercial banks in Namibia are there to facilitate the allocation of financial resources to economic agents. There are four dominant commercial banks in Namibia of which three are South African affiliates, whilst one is a local bank (Bank of Namibia, 2014). The four dominating commercial banks are the First National Bank of Namibia (FNB), Bank Windhoek, Nedbank and Standard Bank of Namibia. FNB was established long before independence, named FNB of South West Africa in 1988 only to be changed to FNB Namibia in 1990. Other banks such as Bank Windhoek also came into existence in 1990. Most of the commercial banks that were in existence merged with the now existing banks. For instance, in 1994 the City Savings and Investment Bank (CSIB) was turned into a commercial bank in 1990, merged with the South West African Building Society (SWABOU) in 2002 that later merged with FNB in 2003 (Mushendami, 2007).

The Namibian economy is mostly dominated by the four commercial banks because the other five banks entered the market after 2012 (Bank of Namibia, 2017). Despite their small number, the commercial banks contributed a fair share of economic growth, accounting for more than 70% of GDP at the end of 2016. In addition to the commercial banks, there are two banking institutions funded by the government. They are categorized per sector, one on infrastructure development while the other focuses on agriculture (Bank of Namibia, 2015).

The government set up these institutions as a platform from where the economic agents could get access to funds for small businesses and other product initiatives. One such institution is the Development Bank of Namibia (DBN) that was established in 2004. This institution was meant to finance long- and short-term development projects both for the public and the private sector. Similarly, the government in its pursuit to assist in the agricultural sector of the Namibian economy also initiated the Agricultural Bank of Namibia (AGRIBANK). Although it dates back as far as 1922, it was amended per the Agricultural Act of 1991. The AGRIBANK provides long-, medium- and short-term loans (Agribank of Namibia, 2015). The short-term loans are meant for crop-production extension while medium-term loans are meant for purchasing agricultural equipment such as vehicles, amongst others and the long-term loans are meant for purchasing assets such as farms.

There is the Post Office Savings Bank (POSB) that provides services such as savings and banking services. This bank is used widely in Namibia, with 120 branches all over the country. It is especially used by elderly economic agents. In 1993 the Namibian government initiated the National House Enterprise (NHE) to develop and finance low-

cost housing in Namibia. The government of Namibia strived towards financial inclusivity; in 2000 they initiated the Small Business Credit Guarantee Trust (SBCGT). The SBCGT aimed at assisting the small business entrepreneurs with financial instruments that would enable them to borrow from the major commercial banks (Mushendami, 2007). The Namibian commercial bank environment was thus well established, accounting for about 70% of GDP International Monetary Fund (2016) as cited in (Paavo, 2017).

Apart from the commercial banks, the Namibian financial sector is made up of other financial entities that are regulated by the Namibian Financial Institution Supervisory Authority (NAMFISA). NAMFISA is responsible for supervising the financial institutions and the financial services as well as to advise the ministry of finance on finance-related matters (Namibia Financial Institution Supervisory Authority, 2017). NAMFISA provides such services in terms of the Namibian Financial Institution Supervisory Authority Act of 2001 (Act No. 3 of 2001). Additionally, NAMFISA monitors and enforces compliance in terms of the Financial Intelligence Act of 2012 (Act No.12 of 2012) under which all financial institutions are registered and licensed. The financial institutions supervised by the Namibian Financial Institution Supervisory Authority are discussed below.

2.6.2 Capital Market

In addition to the commercial banks, the Namibian financial market also has a capital market. Under this market, long-term securities are issued and traded. The Namibian Stock Exchange Market (NSX) is part of the capital market, amongst others, in Namibia. Established in 1992, the Namibian Stock Exchange Market provides a platform to the

economic agents for capital finance. It does so by providing financial instruments such as equity, interest-bearing securities and long-term loans. The total number of firms in the capital market was standing at 39 by the end of 2018 (Namibia Financial Institution Supervisory Authority, 2018)

2.6.3. Insurance companies

There are also insurance companies in the Namibian financial market. They are there to provide services to policyholders. Insurance companies provide benefits to policyholders for unforeseen circumstances such as accidents, ill health, deaths and other tragedies (Mushendami, 2007). Their main source of capital is the premium paid by their customers. They operate by offering two types of insurance services: short-term insurance and long-term insurance. Short-term insurance offers financial benefits under circumstances such as death, ill health, amongst others. The long-term insurance covers the life term insurance. By the end of 2005, Namibia had 16 long-term, 14 short-term insurance companies (Mushendami, 2017). The number of insurance companies more than doubled by the end of 2018, with long-term insurances accounting for 3775 individuals, whilst the short-term insurance companies had 475 clients (Namibia Financial Institution Supervisory Authority, 2018).

2.6.4 Pension Funds

There are nonprofit institutions in the Namibian financial market known as pension funds. They were instituted to provide financial assistance to the economic agents when they are unable to work. According to Mushendami (2007), by the year 2005, Namibia had about 500 pension funds. They more than doubled from merely 179 in 1992. According to the

Namibian Financial Institution Supervisory Authority (2018), the number of pension funds in Namibia stood at 135 by the end of 2018. The Government Institution Pension Fund (GIPF) dominates this market, accounting for over 70%, while Alexander Forbes is the largest pension administrator, accounting for 60% of the market share.

2.6.5 Unit Trust Management Companies

There also are unit trust management companies in the Namibian financial market. These institutions provide platforms that allow investors to partake in diversified investment portfolios. The first unit trust management company was Sanlam, established in 1994. The number grew, standing at 8 registered companies by the end of 2000 (Mushendami, 2007). This number later fell to seven companies by the end of 2017: the FNB, Stanlib, Pointbreak, Prudential, Sanlam, Old Mutual and Capricorn Unit Trusts.

2.6.6 Micro-lenders

Micro-lenders are also part of the Namibian financial market. They provide financial services in the form of small loans to those applicants who qualify. The number of micro-lenders increased, for instance, they more than doubled in 2005, standing at 170 from 34 in 2002 (Mushendami, 2007). There are two types of micro-lenders: the term and the cash lenders. The term lenders grant loans for a longer period, going for a maximum of 48 months, while the cash lenders grant loans for a shorter term of a maximum of 30 days.

All these indicate that the Namibian financial market is well-equipped and stable. Access to finance improves the productivity of an economy through economic agents. At most, these firms play a huge role in the financial market. Improvement in their productivity is

reflected in the overall macroeconomic environment through employment, inflation and gross domestic product.

2.7 An Overview of Namibia's Monetary Policy

According to the literature, macroeconomic activities are influenced by financial variables such as money supply and interest rate. Money supply and interest rates are used to achieve monetary policy goals in most economies and Namibia is no exception. Since Namibia was partly colonized by South Africa, the Namibian monetary system was incorporated into the South African monetary system by default (Sheefeni, 2013). The South African Reserve Bank (SARB) dealt with financial issues in Namibia before independence. In 1960 the South African Reserve Bank opened a branch in Windhoek, Namibia's capital city. In early 1962 the South African rand was introduced in the Namibian economy and began its operation. This branch made it easier for the South African Reserve Bank to allocate notes and coins, administer the exchange control, bank for local commercial banks and to facilitate the operations of the commercial banks in Namibia (Bank of Namibia 2002; Sheefeni, 2013). Although this was the case, the South African Reserve Bank branch in Namibia was not mandated to implement monetary policy.

There was a need for an institution that would develop and implement monetary policy. When Namibia got its independence in 1990, the government established the Bank of Namibia to serve as a central bank. Bank of Namibia was established in terms of the Bank of Namibia Act of 1990 (No.8 of 1990). This Act was later amended in 1997, enabling the Bank of Namibia to offer services as a central bank (Sheefeni, 2013). Through this Act, the Bank of Namibia was there to promote economic growth in Namibia by promoting

and maintaining a sound monetary and financial system; to promote financial stability; serve as a government banker and other functions.

From then onwards the Bank of Namibia has been administering and implementing the monetary policy in Namibia. Since the Bank of Namibia serves as a regulator of depository institutions, the monetary policy is administered through all the depository and financial institutions that are registered and licensed with the Namibian Financial Supervisory Association (NAMFISA). A Monetary Policy Committee in the Bank of Namibia governs the monetary policy in Namibia. The Committee is made up of the Bank of Namibia governor, who is the chair, the deputy governor, advisor to the governor; the directors of research: financial markets and the director of strategic communications and financial-sector development (Bank of Namibia, 2017). The Committee meets every second month to implement the two-month policy. The monetary policy decision is communicated to the public through a media conference.

The Bank of Namibia follows a four-stage policy design as mentioned by Lattie (2000), as cited by Sheefeni, (2013). The first step is the definition of the monetary policy objective. The Bank of Namibia sets the monetary policy objective as price stability. The second step is to set intermediate targets. Since Namibia is part of the common monetary area where the Namibian dollar is pegged to the South African rand, the Bank of Namibia promotes a sound economic and financial strategy. To ensure that parity between the Namibian dollar and the South African rand is not threatened, the Bank of Namibia targets the exchange rate.

The third step was to set the operating targets. Due to the fixed currency peg between the Namibian dollar and the South African rand, it was required that Namibia backs up its

currency in circulation with international reserves. This was done for the Namibian economy to import stable prices from the South African economy. As Namibia has no direct formal operating target, there is no formal target in Namibia. The Bank of Namibia monitors the level of official reserves and uses that as an operating target. The fourth step is the manipulation of the monetary policy instrument.

To control the quantity of money, the Bank of Namibia uses the repo rate. The repo rate is the rate at which the Bank of Namibia lends money to commercial banks. A change in repo rate affects other interest rates and this in return influences the quantity of money. The repo rate in the Bank of Namibia is kept close to that of the South African Reserve Bank. This is mainly because Namibia is integrated into the South African monetary system. This being the case, decisions about the repo rate, economic conditions and prospects in the South African economy are most likely to reflect in the Namibian economy.

2.8 Summary

This chapter presented an overview of the macroeconomic activity indicators alongside that of the three asset markets of Namibia. The following outcomes were evident: the macroeconomic activity indicators show that the macroeconomic activities in Namibia have been fluctuating between 1995 and 2018; similarly, the stock market indicators show that the stock market has seen fluctuations between 1995 and 2018 and indicators of the foreign exchange market as well as those of the housing market in Namibia have been fluctuating over the years as well.

Trends within the three asset markets observed, moved in the same direction with some of the macroeconomic indicators as shown in the figures above. To be specific, trends show that the asset market was improving at a slow increasing pace as some of the macroeconomic activity indicators such as money supply, disposable income and investments improve. The figures also show that the asset markets were improving as some of the macroeconomic indicators such as inflation, real interest rates and terms of trade deteriorated. There might be a link between the movement of the macroeconomic indicators and the asset markets; this study intended to quantify this relationship.

The data also indicated that the stock exchange market and the housing market moved in the same direction between 1995 and 2018. When the house prices were low and moving in almost a constant line, the market capitalization and the overall index in the NSX were also low. They both picked up after 2005 and continued to increase until 2017. The exchange rate fluctuated at an almost constant line between 1995 and 2018. The three asset markets might be interdependent. Some economic agents might treat the three asset markets as substitutes.

An increase in house prices might reduce the purchase of housing. Consumers might channel their resources towards the stock market in the NSX if they find it profitable. Others might direct their resources toward the foreign exchange market, in the hope of yielding profits from currency trading. Either way, rechanneling resources from one of these markets to the other two markets might have an impact on the others. It is from this point that this study intended to assess whether the three asset markets in Namibia were linked to one another through the macroeconomic indicators between 1995 and 2018.

Chapter Three: The Stock Market and Macroeconomic Indicators

3.1 Introduction

This part of the thesis discusses the relationship between the stock market and macroeconomic indicators. It is also in this chapter that the relationship between the Namibian stock market and the macroeconomic indicators is quantified. To find the relationship between the stock market and the macroeconomic indicators in Namibia, this chapter is laid out in five parts.

Firstly, a background on the stock market and the macroeconomic indicators is given. This is where the general link between the stock market and macroeconomic indicators is discussed. Secondly, a literature review is presented. This is where both theoretical and empirical literature is presented. Thirdly, the methodology adopted to assess the relationship between the Namibian stock market and the macroeconomic indicators is displayed and discussed. Fourthly, the empirical results of the relationship between the Namibian stock market and the macroeconomic indicators are presented. Lastly, a conclusion on the relationship between the Namibian stock market and macroeconomic indicators is given.

3.2 The Background of the Stock Market and Macroeconomic Indicators

In general, the stock market is one of the indicators of the direction of economic indicators. This is because stock market movements can be used to forecast future economic conditions. Also, the stock market reallocates funds in the economy through savings and investments (Attari & Safdar, 2013). Apart from it being a good indicator of economic

activities and national development, the stock market also offers a haven to investors (Hussin, Muhammad, Abu & Awang, 2012).

The relationship between the stock market and macroeconomic indicators is observed through changes in the stock prices. Thus, stock prices play an important role in economic growth. Traders and investors in the economy respond to how stock prices change and reflect all the information investors need. For example, if the stock prices rise, some of the investors in the stock market will make profits, and this will attract other economic agents towards the stock market. If this occurs, an increase in the number of investors in the stock market will increase the demand for stocks. An increase in the demand for the stock will in turn push up the price level because of the shortage that it might create from the high expectations that the investors might have. Eventually, the expectations of investors will reduce the price level (Chao, Wei, Leng, Li & Mun, 2016).

On the other hand, macroeconomic conditions can also have an impact on the stock market. This is mainly because the macroeconomic variables can influence future cash flows and share prices (Hussin, Muhammad, Abu & Awang, 2012). At most, participants in the stock markets are the firms in the economy. They invest funds in the stock markets by purchasing shares. This is mainly aimed at increasing the profits and returns of the shareholders. Investors in the stock market make huge profits by exploiting and using the information on macroeconomic activities (Al-jafari, Salameh& Habbash, 2011).

The relationship between macroeconomic activities and the stock market is reflected through variables like industrial production, inflation, money supply, interest rate and real exchange rates (Mehrara, 2006). Industrial production is known to have a positive impact on the stock market (Rahman, Hatta & Ismail, 2013; Chao, Wei, Leng, Li & Mun, 2016).

The relation between industrial production and the stock market is reflected through the expected future cash flow of the business. The impact of the macroeconomic activities on the stock market is mostly reflected in the profits of the firms. An increase in the profits of a firm will bring about an increase in the production of that firm, which in return increases the overall output of that industry in which the firm is operating.

Inflation is known to harm the stock market. A stock market is a capital market where investors channel funds by investing in financial assets such as stocks and others. When inflation is high, it disrupts investments and channels funds towards consumption (Chao *et al*., 2016). This redistribution of funds towards consumption might occur through an increase in wages and salaries of the workers. An increase in wages is a cost to firms, and it might require the firm to reallocate some funds from their investments. This might include financial assets or funds firms intended for investing. This reduces the investment as well as the firm's returns, thus inflation theorizing the negative relation between inflation and a firm's returns.

The other macroeconomic variable known to influence the stock market is the money supply. The money supply is determined by the central bank of the economy, and it is one of the monetary policy tools used to control the quantity of money. The money supply is known to have a positive impact on the stock market (Ratneswary & Rasiah, 2010). An increase in money supply reduces the interest rates, through an increase in liquidity, and this process, in the end, increases the stock returns.

Similarly, the interest rate is also known to have an impact on the stock market. The interest rate is known as the cost of holding money or the cost of capital (Alam & Uddi, 2009). Thus, it harms the stock market. There is this negative relationship in the sense

that, if the interest rate increases, it will reduce the demand for money. Subsequently, this will reduce borrowing, which in return will decrease investment by borrowing and reduce the stock prices in the process.

Apart from the four macroeconomic measures mentioned above, there is also an exchange rate that has an impact on the stock market. The exchange rate, through currency fluctuations, influences the stock market at the domestic level as well as the international level through exports (Nath & Samanta, 2003). An appreciation of the currency, for example, will lead to an increase in stock prices, thereby signifying a positive relationship between the exchange rate and the stock market.

Overall, it is evident that there is a relationship between macroeconomic indicators and the stock market. This relationship has been researched and studied by several scholars. Most scholars have established a relationship between the stock market and macroeconomic indicators in the respective economies, such as Malaysia, Iran, amongst others that are vastly different from Namibia.

As indicated in chapter two, there are fluctuations in the macroeconomic activity indicators. While that is the case, some of the indicators appear to be moving in the same direction as the Namibian Stock Market indicator. There might be a link between the two. It will also be interesting to quantify the relationship between the stock market and macroeconomic indicators in Namibia, as this will add to the literature on this topic in Namibia. It is on this basis that the researcher focused on investigating the nature of the relationship between the stock market and macroeconomic indicators in Namibia. To achieve this objective, the researcher investigated whether there was stock price volatility in the Namibian Stock Market. The intent was also to test the directional of the causal

relationship between the Namibian Stock Market and the five above-mentioned macroeconomic variables.

3.3 Literature Review on Stock Market and Macroeconomic Indicators

This subsection of the study introduces and discusses some of the theories that link macroeconomic indicators and the stock market. It is also where empirical studies similar to this study are reviewed. The first part discusses the theoretical literature, while the second and the last section discusses the empirical literature.

The Present Value Model (PVM) by Smith (1925) is one of the theories that link the stock market and macroeconomic indicators. This theory helps identify the relationship between the stock market and macroeconomic indicators, according to Attari & Safdar (2013). Roll and Ross (1986) later modified the PVM into the Standard Stock Valuation Model and was of the assumption that stock prices reflect the discounted present value of the firm's future cash flow. The firm's output levels contribute to the industrial production of an economy, which measures macroeconomic activities. This would mean that fluctuations in the stock prices can influence the economic indicators, and it can be used as a monetary transmission mechanism.

This boils down to the fact that an increase in the stock prices will make the domestic financial assets more attractive through changes in interest and exchange rates (Al-jafari, Salameh & Habbash, 2011). Al-jafari *et al*., (2011) mentioned that, in addition to the PVM theory, the standard Aggregate Demand-Aggregate Supply Model can also be used to explain the relationship between the macroeconomic indicators and the stock market.

This comes through the change in money supply, which brings a chain reaction in the market through channels such as liquidity and the exchange channel.

The Capital Asset Pricing Model (CAPM) is another theory that links macroeconomic indicators and stock markets (Sharpe, 1964). According to Tangjitprom (2012) and Merton (1973), the CAPM is one the most popular models used to explain the relationship between macroeconomic indicators and the stock market through the expected return on an asset. This theory assumes that not all risks influence stock prices. To make a clear explanation of this idea, Perold (2004) outlined a few assumptions of the CAPM model. The first one is that investors are risk-averse, meaning they do not like to take risks. Secondly, the capital markets are perfect in some areas. Thirdly, all investors have access to the same information. Fourthly, all investors make the same predictions of their assets. Fifthly, it is assumed that there are no taxes or transaction costs.

Lastly, since investors have riskless interest rates, they can borrow and lend freely (Fischer, Michael & Myron, 1972). Investors are part of the economic agents who influence macroeconomic indicators. This is done through personal consumption, investment or through exports and imports. This theory is important because it mainly focuses on investors and how they make decisions. If the investors are free to lend and borrow money, they are most likely to bring about changes in the macroeconomic activities of the economy through consumption. More so, the investors' decisions depend on the macroeconomic environment, which is influenced by factors such as inflation and interest rates, which is the focus of this study. It can therefore be concluded that this theory also links stock markets to macroeconomic indicators.

The other theory is that of the Efficient Market Hypothesis (EMH) by Fama (1970). The EMH stated that, whenever the market is efficient, the perfect information they share can be reflected in the stock market through stock prices (Fama, 1970). This means that in an efficient market, macroeconomic indicators can convey the information investors need to base their investment decisions on, and the investors can use that information to make profits in the stock markets (Mehrara, 2006). This theory is of the assumption that the stock prices respond and adjust very quickly to new information from the market (Chao *et al.* 2016). A market is a place where goods and services are made available, and it is reflected through industrial production is one of the measures of macroeconomic activities. This affirms that there is a relationship between macroeconomic indicators and the stock market.

The theory is further based on the hypotheses that macroeconomic activities can be reflected in the stock market. According to Degutis and Novickytė (2014), the EMH theory is divided into three levels: the weak, the semi-strong and the strong form. The weak form of EHM is based on the assumption that the current stock prices reflect all the information from the past that had influenced it. If this is the case, investors cannot make excess profits in the stock market because such information can come from past trading volumes and other factors that influence the stock market. The semi-strong form of EMH is based on the assumption that the current stock prices reflect both current and past information that influence the stock prices. The last form is the strong type of EMH that is based on the assumption that current stock prices reflect all possible information, and it might be impossible for investors to make excess profits if they only consider some and not all information (Malkiel, 2011). These three forms show that information can be

conveyed to the stock market at different levels. Therefore, the EMH theory shows and states that there is a link between macroeconomic indicators and the stock market.

In addition to the EMH theory, there is another theory called the Arbitrage Pricing Theory (APT) by (Ross, 1976). This theory states that the stock market through stock returns can be influenced by the fluctuations and shocks from macroeconomic indicators. The macroeconomic indicators can significantly explain the stock market through stock returns according to Tangjitprom (2012). It was further stated that this theory showed that the return on a financial asset can be modelled as a linear function of macroeconomic variables (Murcia & Tamayo, 2015). Murcia and Tamayo (2015) further stated that arbitrage acts as a guide to the stock prices, such that, if the stock price diverges, the arbitrage brings it back to the steady-state. The macroeconomic indicators and the stock market are linked by the assumption that multiple economic factors can explain the stock returns. The theory further explains that risk factors, such as interest rates, affect asset prices. This shows that the systematic risk that changes stock returns can be explained by macroeconomic performance. All these theories are evidence that there is a dynamic interaction between the stock market and macroeconomic indicators.

In addition to the theories that hypothesize a relationship between the macroeconomic indicators and the stock market, there are empirical studies that investigated the relationship between the stock market and macroeconomic indicators as discussed below.

3.3.1 Empirical studies on volatility in the stock market

Some scholars tested for the volatility in the stock market using the GARCH models before realizing the relationship between a stock market and macroeconomic indicators.

For example, Tripathy and Gil-Alana (2010) applied exponential generalized autoregressive conditional heteroscedasticity (EGARCH), generalized autoregressive conditional heteroscedasticity (GARCH), threshold generalized autoregressive conditional heteroscedasticity (TGARCH) as well as the asymmetry generalized autoregressive conditional heteroscedasticity (AGARCH) models on daily data for the period January 2018 to December 2018. The findings revealed volatility in the stock market in India.

Similarly, the EGARCH modelling technique was also employed by Oseni and Nwosa (2011) to test for volatility during the period 1986 to 2010. The study showed the presence of volatility in the stock market of Nigeria. Zakaria and Shamsuddin (2012) conducted an empirical study on stock market volatility in Malaysia. In this study, a GARCH model was applied to monthly data for the period 2000 to 2012 and the presence and persistence of volatility were confirmed.

In Amman, El-Nader and Alraimony (2012) employed the ARCH/GARCH models to test for the presence and persistence of volatility. They used monthly data for the period 1991 to 2010. The findings were that the stock market was volatile. Using monthly data, Attari and Safdar (2013) tested for the presence and symmetric effect of volatility in Pakistan. The results showed that the stock market was volatile for the period 1991 to 2012. Similarly, Kirui, Wawire and Onono (2014) conducted a study to determine the presence, persistence and leverage effect in the Kenyan stock market. The study employed the TGARCH modelling technique and found the presence of the leverage effect, but no volatility persistence.

Omorokunwa and Ikponmwosa (2014) also found the presence of stock market volatility in the study for Nigeria. This was done by applying the GARCH model to data for the period from 1980 to 2011. Employing a similar method was Choi and Yoon (2015) on Korean data, and the study found the presence of volatility in the Korean stock market. Closer to Namibia was a study by Cheteni (2016) who also used the GARCH models to test for the presence and persistence of volatility in stock markets of South Africa and China. Using monthly data for the period from 1998 to 2014, the findings showed high volatility in the stock markets of the two economies. Lastly on the empirical studies for stock market volatility is a study by Okechukwu, Mbadike, Thaddeus, Chidiabere and Ezeji (2017) who used the GARCH and EGARCH models to test for volatility. The findings revealed high and persistent volatility in the stock market returns.

3.3.2 Empirical studies on the relationship between macroeconomic indicators and stock markets

With regards to the second objective, there are also empirical studies that examined the relationship between macroeconomic indicators and stock markets. To start with, Giri and Joshi (2015) conducted a study on the stock market development in India. They adopted the Auto Regressive Lag (ARDL) Bound Test together with the Vector Error Correction Model (VECM), using quarterly data between 1996 and 2012. They found a long-run relationship amongst the variables. Furthermore, there was a unidirectional causal relationship between stock development and trade openness, running from trade openness. Similarly, Bist (2017) used the ARDL bound test in his study. The scholar looked at the stock market development and economic growth in Nepal, using annual data from 1993 to 2014. The results revealed cointegration amongst the variables. While variables such

as GDP had a positive impact on the stock market development, others, such as inflation had a negative effect on the stock market. The study further discovered a unidirectional causal relationship between the stock market and economic growth, running from the stock market.

Cheah, Yiew and Ng (2017) did a study on Malaysia, using a nonlinear ARDL to assess the relationship between stock price and exchange rate. They used monthly data from 1993 to 2015. They found cointegration amongst the variables observed. Demir (2019) did a study on macroeconomic determinants of stock market fluctuations in Turkey. The author adopted the ARDL approach and used quarterly data between 2003 and 2017. The results indicated that there was cointegration amongst the variables. The scholar also conducted the ECM that indicated a long- and short-run relationship between the volatility in the stock market and the macroeconomic determinants.

Scholars such as Maghayereh (2000) did a study on the relationship between the stock prices and macroeconomic variables in Jordan, using monthly time series data between 1987 and 2000. The scholar made use of the Vector Autoregressive Model, together with the cointegration technique. Furthermore, the author made use of industrial production, inflation, interest rate, the trade balance and money supply as macroeconomic indicators, while the stock price index was used as a proxy for the stock market. The results indicated that there was a long-run relationship between the stock price index and the macroeconomic activity indicators. The results further indicated that the stock price was significantly linked to the macroeconomic activities in Jordan.

Morelli (2002) tested for the relationship between the stock market and the macroeconomic activities in the UK. The study found that macroeconomic activities did

not explain the stock market. Maysami, Howe and Rahmat (2004) did a study testing for the relationship between macroeconomic variables and stock market indices, using the cointegration approach on Singapore. The results indicated a cointegration relationship between the stock market and the sectoral indicators in Singapore.

On the contrary, Sohail and Hussain (2009) conducted a study in Pakistan using the Vector Error Correction Model (VECM) on monthly data for the period 2002 to 2008. The findings revealed a long-run relationship between the stock market and macroeconomic activities. They specifically discovered that CPI had a negative impact on the stock market, while the other macroeconomic variables considered had a positive impact on the stock market. They also noticed a high speed of adjustment toward the long-run equilibrium. Similarly, Rahman, Sidek and Tafri (2009) used an Error Correction Model (ECM) in Malaysia and found that there was a relationship between the stock market and macroeconomic activities.

Asmy, Rohilina, Hassam and Amin (2010) used the approach of the ECM on the monthly data for the period 1987 to 2007 for the Malaysian economy. The authors found a long-run relationship between the stock market and the macroeconomic activities, with CPI influencing the stock market positively. The findings above are also supported by the study of Oseni and Nwosa (2011) who found that there was a relationship between the two variables. This was revealed by the data for the period 1986 to 2010 for the Nigerian economy. Similarly, Zakaria and Shamsuddin (2012) also tested for the relationship between the stock market and the macroeconomic activities for Malaysia. The findings revealed a statistically significant relationship between the two variables for the period 2000 to 2012. These results are similar to that of El-Nader and Alraimony (2012), who

also found a relationship between the stock market and macroeconomic activities. In specific terms, a positive impact of the gross domestic product on the stock market was found while a negative impact from the other macroeconomic activity variables was observed. This was revealed by the data for the period 1991 to 2010 for the economy of Amman.

More scholars who used the VECM modelling approach include Issahaku, Domanban and Ustarz (2013) who conducted a study on Ghana, using data between 1995 and 2010. The findings revealed a long-run relationship between the stock market and macroeconomic activities in Ghana. Similarly, Lekobane and Khaufelo (2014) also used the VECM to test for the relation between the stock market and macroeconomic activities in Botswana. Their results showed a positive long-run relationship between the stock market and macroeconomic activities. Other studies such as that of Ray and Saha (2016) tested for the dynamic association between macroeconomic activities and the stock market in India. The results showed a statistically significant relationship between macroeconomic indicators and the stock market. Lastly, Giri and Joshi (2017) conducted a similar study on India using the VECM. The data for the period 1979 to 2014 revealed a long-run relationship amongst the variables.

3.3.3 Empirical studies on the causal relationship between macroeconomic indicators and the stock market

There are also empirical studies on the causal relationship between the two variables. That is, to determine whether there is any predictability amongst the variables, which is the third objective of this study. Amongst such studies is Mehrara (2006) who conducted a study testing for the causal relationship between macroeconomic aggregates and stock

prices in Iran. Using the Granger-causality Test, the researcher found that there is a unidirectional long-run causal relationship between the stock market and the macroeconomic variable, running from macroeconomic activities to the stock market. Similarly, Puah and Jayaramaw (2007) found a causal relationship between the two variables. However, they discovered that only real exchange and the output Granger cause the stock price. This was revealed by the quarterly data for the period between 1997 and 2004 in Fiji. Unlike the previous study, Acikalin, Aktas and Unal (2008) found a unidirectional causal relationship between the stock market and macroeconomic indicators in Turkey.

There are findings from other studies that confirmed a bidirectional causal relationship among the variables. These studies include Asmy, Rohilina, Hassam and Amin (2010) who conducted a Granger-causality between the stock market and macroeconomic activities in Malaysia. Using monthly data for the period 1987 to 2007, the researcher found bidirectional causality between the exchange rates and the stock market. Similarly, Ibrahim (2011) also conducted a study on Thailand, using the Granger Causality Test on quarterly data for the period 1993 to 2007. The findings also confirmed a bidirectional causal relationship between the stock market and macroeconomic activities. In the same fashion, Al-Majali and Al-Assaf (2014) conducted a causality test between the stock market and macroeconomic activities in Jordan using quarterly data for the period 1992 to 2014. They also found a bidirectional causal long-run relationship between the stock market and some of the macroeconomic variables considered.

In India, Tiwari, Mutascu, Albulescu and Kyophilavong (2015) found a unidirectional causality, running from the stock market toward the macroeconomic activities through

industrial production. This was confirmed by the monthly data for the period 1993 to 2011. On the contrary, the study of Ajayi and Olaniyan (2016) on the UK and South African economies found no causality between the two variables. Alrub, Tursoy and Rjoub (2016) as well as Rjoub, Civcir and Resatoglu (2017) conducted a Granger Causality Test in Turkey. They found a bidirectional causal relationship between macroeconomic activities and the stock market. Lastly, Giri and Joshi (2017) conducted a Granger Causality Test on India, using data for the period 1979 to 2014. They also discovered a unidirectional causality, running from the macroeconomic indicators to the stock market.

The literature review shows different hypotheses regarding the relationship between the stock market and macroeconomic activities. Also, despite the different methodological approaches, there is evidence of the relationship between the two variables. When it comes to empirical studies in Namibia on this topic, Eita (2012) did a study closely related to this one, modelling macroeconomic determinants of stock market prices in Namibia. He used the Johansen multivariate cointegration test as well as the VECM methodology on data for the period 1998 to 2009. The findings were that macroeconomic determinants promoted stock prices in Namibia. This study differs from that of Eita (2012) in the sense that the mentioned author did not test for volatility nor did the author look at causality issues. Besides, there was a time gap of 10 years and a lot has happened. This calls for a renewed study on the subject matter to get a picture of the current empirical developments. Eita (2012) covers from 1998 to 2012 while this study covers from 1995 to 2018.

3.4 Methodology

To capture the relationship between the Namibian Stock Market and macroeconomic indicators, the study adopted a three-method approach that specifically addressed each

objective. For the first objective, which was to ascertain the existence of stock price volatility, the study followed the Autoregressive Conditional Heteroscedasticity (ARCH) model. For the second objective of determining the relationship between the Stock Exchange Market and macroeconomic activities, the study employed the Autoregressive Distributed Lag (ARDL) model together with the Error Correction Model (ECM) modelling approach. Lastly, for the third objective of determining the causal relationship between the Namibian stock market and the macroeconomic indicators, the study utilized the Granger Causality Test. All these specific objectives were linked to the main objective of ascertaining the relationship between the Namibian stock market and the macroeconomic activity variables. All the approaches adopted in this study are discussed in detail below.

3.4.1 Model Specification and Econometric Framework

For the first specific objective, the researcher followed models similar to the one used by Okechukwu *et al*., (2017). The first step required testing for the presence of the Autoregression Conditional Heteroscedasticity (ARCH) effects to determine the presence of volatility. The ARCH effect was tested based on the null hypothesis that there is no volatility while the alternative hypothesis is that of a presence of volatility.

The decision was made by comparing the probability value with the level of significance. If the probability value is less than the level of significance, the null hypothesis is rejected. However, if the probability value is greater than the level of significance, then the null hypothesis cannot be rejected. It follows that if there is a presence of volatility, the GARCH model can be estimated. The GARCH model is to be used to measure the persistence of the volatility in the stock market if it is there.

Engle (1982) suggested the ARCH model, and it is used to test for the significance of the conditional variance, also known as the ARCH effects (Salisu & Oloko, 2015). According to Diebold and Nerlove (1989), the conditional structure of the variables observed arises from the common factor that creates common volatility. Brook (2008) stated that the conditional variance can be denoted by U_t such that the autocorrelation in volatility is modelled by the conditional variance of the error term, depending on the previous value of the squared error, such that:

$$\sigma_t^2 = \propto_0 + \propto_1 u_{t-1}^2 \qquad 3.1$$

Equation 3.1 is the ARCH (1) in which the conditional variance depends on one lagged error, such that the conditional mean is expressed as:

$$y_t = \beta_1 + \beta_2 X_{2t} + \cdots \beta_n X_{nt} + U_t \quad such\ that\ U_t \sim N(0, \delta_t^2) \qquad 3.2$$

$$\delta_t^2 = \alpha_0 + \alpha_1 U_{t-1}^2 \qquad 3.3$$

Equations 3.2 and 3.3 can further be expanded to a more general equation, where the error variance depends on *n* number of lags of squared errors known as an ARCH (*n*) model. Generally, that is how the ARCH model can appear (Brooks, 2008).

For the second specific objective, the researcher used the ARDL approach. It is important to note that the study conducted them based on a simple model, similar to the one used by Puah and Jayaramaw (2007), which is specified as follows:

$$SM = f(IP, M2, INFL, RIR, RER) \qquad 3.4$$

where SM represents the stock market, IP is industrial production, M2 is the real money supply, INFL is the inflation rate, RIR is the real interest rate and RER is the real exchange rate.

Equation 3.4 is expressed as a linear model and it becomes:

$$lnSM = \beta_0 + \beta_1 lnIP_t + \beta_2 lnM2_t + \beta_3 lnINFL_t + \beta_4 lnRIR_t + \beta_5 lnRER_t + u_t \quad 3.5$$

where β_0 is a constant; $\beta_1 \, to \, \beta_5$ are coefficients; u_t is the error term and all the other variables are as defined in equation 3.4.

To test for the long- as well as the short-run relationship between the Namibian stock market and the macroeconomic activities, this study made use of the Auto Regressive Lag (ARDL) and Error Correction Model (ECM) approach by (Pesaran, Shin & Smith, 2001). The ARDL is applied when the variables are integrated of I (0) or I (1). It also allows variables to have different lags (Lawal, Nwanji, Asaleye & Ahmed, 2016). The study adopted an ARDL equation similar to the one used by Joshi and Giri (2015) that appears as follows:

$$\Delta lnSM_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \, \Delta lnSM_{t-i} + \sum_{i=0}^{n} \beta_{2i} \, \Delta lnIP_{1t-i} + \sum_{i=0}^{n} \beta_{3i} \, \Delta lnM2_{2t-i} + \sum_{i=0}^{n} \beta_{4i} \, \Delta lnINFL_{3t-i} + \sum_{i=0}^{n} \beta_{5i} \, \Delta lnRIR_{4t-i} + \sum_{i=0}^{n} \beta_{6i} \, \Delta lnRER_{5t-i} + \theta_{7i} lnSM_{t-i} + \theta_{8i} lnIP_{t-i} + \theta_{9i} lnM2_{t-i} + \theta_{10i} lnINFL_{t-i} + \theta_{11i} lnRIR_{t-i} + \theta_{12i} lnRER_{t-i} + \varepsilon_t \quad 3.6$$

where all the SM, IP, M2, INFL, RIR and RER are as defined in equation 3.4. Δ is the first difference operators, while β_{01} is the constant term. The short-run coefficients are represented by $\beta_{1i}, \ldots, \beta_{6i}$, and the long-run coefficients are represented by $\theta_{7i}, \ldots, \theta_{12i}$;

$n1 \ldots . n6$ is the lag length and ε_{t1} is the white-noise error term. To test for the cointegration relationship between the Namibian Stock Market and macroeconomic activity indicators, the null hypothesis that H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ is tested against the alternative hypothesis of$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6$. The decision rule is made by comparing the F-statistics value with the upper and lower critical values. If the F-statistics value is higher than the upper critical value, then the null hypothesis is rejected. The ECM representation of the ARLD is represented as:

$$\Delta lnSM_t = \beta_{01} + \sum_{i=1}^{n} \beta_{11} \Delta lnSM_{t-i} + \sum_{i=0}^{n} \beta_{12} \Delta lnIP_{t-i} + \sum_{i=0}^{n} \beta_{13} \Delta lnM2_{t-i} +$$
$$\sum_{i=0}^{n} \beta_{14} \Delta lnINFL_{t-i} + \sum_{i=0}^{n} \beta_{15} \Delta lnRIR_{t-i} + \sum_{i=0}^{n} \beta_{16} \Delta lnRER_{t-i} + \alpha ECM_{t-1} \quad 3.7$$

Equation 3.7 is the ECM model used to indicate the speed of adjustment towards the long-run equilibrium, after the shocks in the short run. The ARDL-ECM approach was put through several diagnostic tests to ensure that the model was fit. These included the serial correlation and the normality tests along with the Heteroscedasticity test. The CUSUM and CUSUMQ tests were also conducted to test for the stability of the model (Cheah, Yiew and Ng, 2017).

For the third specific objective, the study utilized the Causality Test by Granger (1969) to determine the direction of causality among the variables. The test is best used for forecasting and also testing whether or not one variable helps predict the other. In this case, a model similar to the one used by Sheefeni (2013), Pooja (2018) and by Ahmed, Vveinhardt, Streimikiene and Fayyaz (2017) was applied, which was specified as follows:

$$X_t = \rho_0 + \sum_{i=1}^{n} \rho_{1i} X_{t-1} + \sum_{i-1}^{n} \rho_{2i} Y_{t-1} + \mu_{1t} \quad 3.8$$

$$Y_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} X_{t-1} + \sum_{i=1}^{n} \delta_{2i} Y_{t-1} + \mu_{2t} \quad 3.9$$

The causal relationship between the variables considered was made based on the coefficients in equation 3.13 and 3.14. If $\rho_{2i} \neq 0$ while $\rho_{1i} = 0$ then Y can explain X; $\delta_{1i} \neq 0$ while $\delta_{2i} = 0$ then X can explain Y; while on the other hand $\rho_{2i} = 0$ while $\delta_{1i} = 0$ both Y and X are independent, and they do not explain each other, but if $\rho_{2i} \neq 0$ while $\delta_{1i} \neq 0$, X and Y are interactive and they help explain one another.

This study made use of the macroeconomic time-series data that are most likely to be trended as it is known for economic variables. Since time series data of the variables that are trended is most likely to be non-stationary, the data were tested for the presence of unit root. This test was also conducted to reveal the order of integration. To test for the unit root, the Kwiatkowski Phillips Schmidt Shin (KPSS) by Kwiatkowski, Phillips, Schmidt & Shin (1992) was used. KPSS is one of the standard tools for analyzing time series data (Kokoszka & Young, 2015). It is based on the null hypothesis that $H_0: x_t = \alpha + \beta_t + \pi_t$ is a stationary time series, while the alternative hypothesis is that there is a random walk, which determines the long-term behaviour of the series (Kokoszka & Young, 2015). This technique is based on the following model:

$$Y_t = \beta' Z_t + u_t + W_t \qquad 3.10$$

$$u_t = u_{t-1} + \varepsilon_t \qquad 3.11$$

Where Z_t is the constant and trend, W_t is 1(0) and u_t is the pure random walk innovation variance? The KPSS test is based on the LM test of the hypothesis that the variance of the random walk is 0 (Arltova & Fedora, 2016). The KPSS test, therefore, test for the null hypothesis of stationarity (e.g H_0 of stationarity) against the alternative hypothesis of non-

stationarity (Eita, 2012). According to Kokoszka and Young (2015), the rejection of the null hypothesis is in favour of unit root.

The study also adopted the Phillips-Peron (PP) test by Phillips and Peron (1988) to test for stationarity along with the KPSS test. The PP test follows the Schwarz Bayesian Information criterion as well as the Bartlett Kernel in Newey and West (1994) when selecting the lag length criterion as well as the bandwidth. The PP test can be expressed by the following equation:

$$\Delta Y_t = \propto + \beta Y_t + \varepsilon_t \qquad 3.12$$

The PP is known to relax the assumption of autocorrelation and deals more with serial correlation in the errors in comparison to other unit root tests. The PP tests the null hypothesis of the unit root (non-stationarity), with the alternative hypothesis postulating no presence of unit root (stationarity). The decision is made by comparing the calculated values with critical values. Particularly, if the calculated value (in absolute terms) is greater than at least one of the critical values at a specific level of significance, then the null hypothesis of non-stationarity is rejected, and the opposite applies. The placing of emphasis on absolute value stems from the fact that the PP works with negative values.

3.4.2 Data and data sources

The study used quarterly data for the period 1995 to 2018 to answer the objectives of the study. The overall index was used as a proxy for stock prices in the Namibian stock market. It was used to represent the stock market and as a dependent variable. The data on the stock market was obtained from the Namibian Stock Exchange. The macroeconomic activity variables considered were the industrial production, real money

supply, inflation, real interest rate and real exchange rates. The macroeconomic activity variables were the independent variables. The data was collected from the Namibian Stock Market, the Bank of Namibia and the Namibian Statistics Agency.

3.4.3 Justification and Measurement of Variables

Stock Prices

The stock price is one of the major factors in the stock exchange market. Most of the scholars used it in their studies whenever the stock exchange market is involved. The stock price is used as a proxy for the stock market, as used by scholars such as Puah and Jayaramaw (2007), Al-Majali and Al-Assaf (2014), Ali (2011) amongst others. The all-share index is used as a proxy for stock prices, as was done by Kolapo *et al*. (2018) in their study in Nigeria. It is expressed in Namibian dollars, and it is expected to have both a negative and a positive impact on the macroeconomic activities in Namibia. The data was collected from the Namibian Stock Market.

Industrial Production

Industrial production represents the overall output per industry in an economy. It is one of the ways to measure economic output at a given point in time. The level of industrial output determines the productivity of the firms as well as their total revenue. An increase in productivity increases totals profit, which increases the level of firms' investments, other factors being the same. Some of the returns of the firms are invested in financial assets in the stock market, all the reason why industrial productivity is an important indicator. Industrial production can reflect the role of the stock market in the macroeconomic environment. Tiwari *et al*. (2015), Ajayi and Olaniyan (2016), amongst

others, used it as a macroeconomic indicator in their studies on the stock market. Real industrial production expressed in millions of Namibian dollars was used and the data was obtained from the Namibian Statistics Agency. It was expected to have a positive impact on the stock market.

Money Supply

The money supply is the total amount of money supplied in an economy. The quantity of money supply influences the economy through the purchasing power of the economic agents. An increase in money supply increases consumption of both goods and services as well as financial assets, some of which are in the stock market. Therefore, the amount of money supply can reflect the stock market in the macroeconomy, and that is why it was used as one of the macroeconomic indicators. Studies on the stock exchange by Okechukwu *et al*. (2017) and El-Nader *et al*. (2012) have used it, and it was expected to have a positive impact on the stock market. The total money supply was expressed in Namibian dollars and the data was acquired from the Bank of Namibia.

Inflation

Inflation is the persistent increment in the price level. Inflation has an impact on the purchasing power of the economic agents as well as on the revenues of the firms. This in return will affect the output as well as investment levels of the firms, which includes the purchase of financial assets in the stock market. The level of inflation is thus an important macroeconomic indicator; scholars such as Okechukwu *et al*., (2017), Ray *et al*., (2016) and El-Nader and Alraimony (2012) have used it in their studies. Inflation is expressed in

percentages and the data was collected from the Namibian Statistics Agency. Inflation is expected to have a negative effect on the stock market.

Real Interest Rates

Parkin (2014) defined the real interest rate as the nominal interest rate adjusted for inflation, and it is generally known as the opportunity cost for holding money. Interest rate plays a huge role in the financial market, such that it is even used as one of the policy tools. At most, it is used to control the quantity of money, controlling the quantity of money, inflation as well as the level of overall output in an economy. This might have an impact on the financial assets traded on the stock market through credit availability, thus it is an important indicator of macroeconomic activities. Okechukwu *et al*., (2017), as well as Marie, Tomas and Daniel (2016), used it in their studies. The real interest rate is expressed in percentages, and it is expected to have a negative impact on the stock market. The data was collected from the Bank of Namibia.

Real Exchange rate

The real exchange rate is the price of currencies in the foreign exchange market. According to Mudenda and Sherbourne (2001), the real exchange rate is important to the economy because it determines the level of investment in an economy, some of which comes through the stock market. Furthermore, the exchange rate influences the level of exports and imports, which determine the overall productivity of an economy. Scholars such as Ray and Saha (2016) used it in their studies as a determinant of macroeconomic activities on the stock market where it is expected to have a positive effect. Real effective exchange rate data was used, and it was collected from the Bank of Namibia.

3.5 Empirical Results

3.5.1 The Autoregressive Conditional Heteroscedasticity Results

The objective was to test for the presence of volatility in the Namibian stock market using the ARCH/GARCH model. The first step was to test for the ARCH effects that reveal volatility or otherwise. The ARCH effect was tested based on the null hypothesis that there was no volatility while the alternative hypothesis was that of a presence of volatility. The decision was made by comparing the probability value with the level of significance, such that, if the probability value was less than the level of significance, the null hypothesis would be rejected. However, if the probability value was greater than the level of significance, the null hypothesis could not be rejected. The results of the ARCH effect are presented in table 3.1 below.

Table 3.1: ARCH effect test

Heteroscedasticity Test: ARCH			
F-statistic	0.00	Prob. F (1,92)	0.95
Obs*R-squared	0.00	Prob. Chi-Square (1)	0.95

*Source: Author's compilation using EViews. Notes: ** means the rejection of the null hypothesis at 5%*

The results showed that at a 5% level of confidence, the probability values (0.95) were all greater than 0.05. This meant that the null hypothesis of no ARCH effect could not be rejected, and the conclusion was that there was no volatility. These results were similar to the ones found by Kirui *et al*., (2014) in their study on the Kenyan economy. The ARCH

model was used to test for the significance of the conditional variance, as stated earlier. In this case, there was no presence of the ARCH effect, meaning that the model was not significant for the conditional variance. This also showed that in this case, there was no need to estimate GARCH and EGARCH models because they were only used or appropriate when the ARCH effect/volatility was found.

3.5.2 The ARDL Bound Test for Co-integration

After the ARCH effect test, the data were tested for multicollinearity. Multicollinearity occurs when two or more variables used for prediction in multiple regression, are highly correlated (Daoud, 2017). The multicollinearity results for the independent variables are presented in Table 3.2 below.

Table 3.2: Correlation Results for the Independent Variables

	LNIP	**LNM2**	**LNRIR**	**LNRER**	**LNINFL**
LNIP	1	0.99	-0.53	0.52	-0.53
LNM2	0.99	1	-0.52	0.55	-0.48
LNRIR	-0.53	-0.52	1	-0.10	0.04
LNRER	0.52	0.55	-0.10	1	-0.49
LNINFL	-0.53	-0.48	0.04	-0.49	1

Sources: Author's computation using EViews

The results indicated that the correlation coefficients of most variables fall under 0.56. The correlation coefficients of industrial production and money supply, however, were as high as 0.99. This indicated that industrial production and money supply in Namibia were highly correlated. This was to be expected, as production changes as money supply changes. The presence of multi-collinearity sometimes causes a problem. It is mostly sorted by dropping one of the variables amongst those that are highly correlated (Daoud,

2017). Vatcheva, Lee, McCormick and Rahbar (2016) stated that multicollinearity leads to unstable and biased standard errors. Although this was the case, it did not affect the overall fit or prediction of the model (Vatcheva *et al*., 2016).

Both industrial production and money supply could not be dropped because they played a huge role in predicting the relationship between the stock market and the macroeconomy. On the one hand, scholars such as Okechukwu *et al*., (2017) amongst others, indicated that money supply is one of the major macroeconomic indicators that predict the stock market. On the other hand, theories such as the PVM and the EHM justified the use of industrial production on studies looking at stock markets.

As mentioned in section 3.3.1, the nature of the data dictated that the unit root test was conducted. The unit root test is generally conducted to test whether the time series is fit for regression and not nonsensical. The PP and the KPSS tests were conducted in this case and the results are presented in the table below. It is, however, important to note that the PP test tested for the null hypothesis of non-stationarity (e.g H_0 of no stationarity), while the KPSS tested for the null hypothesis of stationarity (e.g H_0 of stationarity). The results of the unit root test are presented in Table 3.3 below.

Table 3.3: The Unit Root Results of the PP and KPSS tests

Variable	**M.S**	**PP**		**KPSS**		**O. I**
		Levels	**1st diff.**	**Levels**	**1st diff.**	
LnSM	Intercept	-0.77	-5.83**	1.23	0.04*	1
	Intercept & Trend	0.20	-5.80**	0.16	0.04*	1

LnIP	Intercept	0.79	-4.72**	1.29	0.17*	1
	Intercept & Trend	0.89	-4.76**	0.09*	0.14*	0
LnM2	Intercept	-1.44	-5.51**	1.30	0.10*	1
	Intercept & Trend	-1.58	-5.54**	0.14*	0.08*	0
LnINFL	Intercept	-2.47	-5.01**	0.45*	0.04*	0
	Intercept & Trend	-2.79	-4.97**	0.06*	0.04*	0
LnRIR	Intercept	-6.22**	-6.85**	0.72	0.23*	1
	Intercept & Trend	-6.02**	-6.22**	0.03*	0.04*	0
LnRER	Intercept	-1.90	-5.15**	0.55	0.09*	1
	Intercept & Trend	-2.48	-5.10**	0.17	0.09*	1

*Source: Author's compilation using EViews. Notes: M.S means model specification; diff. means difference; OI means the order of integration; ** means the rejection of the null hypothesis of no stationarity at a 5% level of confidence for the PP test, while *means no rejection of the null hypothesis of stationarity at 5% level of confidence for the KPSS test.*

Table 3.3 indicates that almost all the variables were stationary in the first difference under the PP test. The real interest rate was the only variable that was stationary in levels under the PP test. The KPSS on the other hand revealed that most of the variables were stationary in levels at a 5% level of confidence. The Namibian Stock Market indicator and the real exchange rates were the only two variables that were only stationary in the first difference. Overall, the PP and KPSS unit root tests revealed a mixture or combination of order or

integration ranging from zero to one. After stationarity had been established, the next step was to test for cointegration as described in the next section.

The idea behind the cointegration test was to test whether or not there was a long-run relationship between the variables. Since the order of integration ranges between zero and one, the ARDL bound test was used to test for cointegration. It is a tradition that, before the ARDL model is used for any analysis, it should be tested for spuriousness by conducting some fitness test. In this case, three tests were conducted. First, the lag exclusion test was conducted. This test was done to indicate the number of lags that are ideal for the model. Nkoro and Uko (2016) stated that the lag length is important because it leads to the determination of standard error terms that do not suffer from autocorrelation amongst others. The selection was done based on five tests and the results are presented in Table 3.4 below.

Table 3.4: Optimal Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	78.79	NA	4.29	-2.24	-2.04	-2.16
1	654.65	1027.7	2.63	-18.85	-17.45	-18.30
2	735.25	128.96	6.86	-20.22	**-17.61****	-19.19
3	756.51	30.09	1.16	-19.77	-15.96	-18.27
4	778.08	26.55	2.09	-19.33	-14.31	-17.35
5	939.21	168.57	5.74	-23.18	-16.95	-20.72
6*	1005.02	**56.69****	**3.50****	**-24.09****	-16.67	**-21.16****
7	1035.71	20.77	8.15	-23.93	-15.30	-20.52

*Source: Author's compilation using EViews. Notes: (a)** indicates the lag order selected by the criterion. (b) LR is the sequential modified LR test statistics; FPE is the final prediction error, AIC is the Akaike information criterion, SC is the Schwarz information criterion while HQ represents the Hannan-Quinn information criterion.*

The lag that was selected by the majority of the tests, was the one that was selected and used in the ARDL. However, theory informs us that the AIC and SIC tests are mostly used, especially the SIC for its consistency. The theory further postulates that the HQ test is appropriate for quarterly data. In this case, 6 lags were selected. This was similar to the study by Joshi and Giri (2015), where the lags selected by the majority of the tests were used.

Having selected the lags needed, the ARDL test was conducted. The aim was to test for the presence of the long-run relationship between the Namibian stock market and the macroeconomic activity indicators under investigation. The null hypothesis was that there was no cointegration, while the alternative hypothesis was that there was cointegration. The decision rule was made by comparing the calculated F-statistic with the two sets, the lower and the upper bound critical values (Peša, Wrońska-Bukalska, & Bosna, 2017). If the F-statistic value was more than the upper bound critical value, the null hypothesis would have been rejected. If the F-statistic was below the upper bound critical value, then the null hypothesis of no cointegrating would not be rejected. The results of the ARDL test are presented in table 3.5 below.

Table 3.5: The ARDL Bound Test Results

Test Statistic	**Value**	**Significance**	**I(0) Bound**	**I(1) Bound**
F-statistic	4.51	10%	2.08	3.00**
K	5	5%	2.39	3.38**
		2.50%	2.70	3.73**
		1%	3.06	4.15**

*Source: Author's compilation using EViews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

The results in table 3.5 indicate that the F-statistic value is greater than the upper bound critical values at 5%. The null hypothesis of no cointegration was rejected and a conclusion that there was a long-run relationship between the Namibian stock market and the macroeconomic activity variables investigated. These results were similar to those found by Demir (2019) and those by Peša *et al*., (2017) in their studies. The long-run coefficients from the cointegration equation are presented in table 3.6 below.

Table 3.6: Estimated Long-run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNIP	0.75	0.99	0.75	0.45
LNM2	0.19	0.29	0.66	0.50
LNINFL	-0.19	0.18	-1.08	0.28
LNRIR	-0.10	0.06	-1.62	0.11
LNRER	2.11	0.68	3.10	0.00**
C	-13.13	9.83	-1.34	0.19

*Source: Author's compilation using EViews. ** denotes statistical significance at a 5% level of confidence.*

The findings in table 3.6 indicate that industrial production, money supply and real exchange rates had a positive effect on the NSX in the long run. Industrial production had a positive non-significant impact on the Namibian stock exchange. The Namibian stock market improved by 0.75% as industrial production increased by 1%. This is an indication that, as firms increase their production, they are most likely to increase their demand for stocks in the NSX. This is the process that increases stock prices.

The positive relationship between industrial production and the stock market is in line with economic theory because, as stated in the Efficiency Market Hypothesis, the stock market can be reflected in the goods and services market. An increase in productivity of the firms in the domestic economy increases revenue as well as profit for the firm, availing

funds for investments. If these funds in the firms are invested in the stock market, the demand for stocks will go up against a fixed supply, pushing the stock prices up in return. These findings are also similar to that of El-Nader and Alraimony (2012), Lekobane and Khaufelo (2014), Joshi and Giri (2015) those by Ajayi and Olaniyan (2016) and those by (Kolapo *et al*., 2018).

Money supply also has a positive and statistically insignificant impact on the stock prices in the NSX. A 1% increase in the money supply, in this case, increases the stock prices by 0.19%. This shows that in Namibia, an injection of money into the economy increases the demand for stocks and shares in the NSX. An increase in the demand creates a shortage, which in the process increases the stock prices. The positive relationship between money supply and the stock prices is in line with theory as mentioned by Ratneswary and Rasiah (2010), in the sense that an increase in money supply increases the stock prices through a reduction in the interest rate. The findings are also agreeing with that of Sohail and Hussian (2009) in their study on Pakistan.

If the real exchange rate improves by 1%, the stock prices increase by 2.11%. The effect of the real exchange rate on the NSX is positive and statistically significant. The results suggest that an appreciation of the Namibian dollar will lead to an increase in the stock prices in the NSX. It shows that, as the Namibian dollar appreciates, the financial goods in the NSX become attractive to investors. As the demand for financial goods increases, so does the stock prices in the NSX. These results are similar to those that were found by Sohail & Hussian (2009); those found by Demir (2019) on the Turkish Stock market and those observed by Kolapo *et al*., (2018) in Nigeria. Similarly, the positive relationship between the real exchange rate and the stock market was also in line with theory as

mentioned by Nath and Samanta (2003), such that an increase in the exchange rates will push the stock prices up.

The results show that inflation and real interest rate had a negative effect on the NSX. As indicated in table 3.6, a 1% increase in inflation would reduce the stock prices by 0.19%. These results propose that an increase in the general price level leads to a fall in the stock prices, thus the negative reaction of the NSX. The negative impact of inflation on the NSX is as expected through theory. An increase in inflation reduces the purchase of financial assets. These results are similar to those found by Bist (2017) on the economy of Nepal.

The negative impact of the real interest rate on the NSX is also as expected by theory. The results in table 3.6 indicate that the stock price fell by 0.10% and the real interest rate increased by 1%. This suggests that an increase in the real interest rate makes financial assets outside the NSX more attractive. This channels funds away from the NSX, creating a surplus of their financial goods and services. In the process, the stock prices will start to fall, thus a negative relationship between the NSX and the real exchange rate. The negative relationship between real interest rates and stock prices is like the one found by Kolapo et al., (2018), in their study in Nigeria. The results thus quantify the long-run relationship between the NSX and the macroeconomic indicators. After the long-run estimates, the ECM from the ARDL was conducted.

3.5.3 The ARDL-based Error Correction Model

The ARDL-based ECM was conducted to observe whether the macroeconomic indicators drove the NSX towards the long-run equilibrium from the short-run. The short-run empirical results are shown in Table 3.7 below.

Table 3.7: Estimated Short-run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNIP)	-1.84	0.61	-3.02	0.00**
D(LNM2)	0.04	0.06	0.68	0.50
D(LNINFL)	0.11	0.05	2.02	0.05**
D(LNRIR)	0.01	0.02	0.35	0.72
D(LNRER)	2.16	0.44	4.89	0.00**
D(LNRER(-1))	-1.35	0.47	-2.86	0.01**
CointEq(-1)*	-0.23	0.04	-5.94	0.00**
R-squared	0.61	**Mean dependent var**		0.02
Adjusted R-squared	0.57	**S.D. dependent var**		0.09
S.E. of regression	0.06	**Akaike info criterion**		-2.69
Sum squared resid	0.25	**Schwarz criterion**		-2.42
Log-likelihood	116.59	**Hannan-Quinn criteria**		-2.58
Durbin-Watson stat	2.00			

*Source: Author's compilation using EViews. ** denotes statistical significance at a 5% level of confidence.*

The results in table 3.7 indicate that the ECM coefficient (-0.23) is negative and statistically significant at 5%. If the ECM coefficient lies between 0 and -1, the convergence of the long-run equilibrium responded to external shocks (Joshi & Giri, 2015; Kolapo *et al*., 2018). This is an indication that, if the NSX deviated from the equilibrium in the current period, it will be corrected by 23% in the next period. The coefficient of the R-square is 61, meaning that 61% of innovations in the stock market can be explained by industrial production, money supply, inflation, real interest rate and real exchange rate. 39 % of the fluctuations in the stock market are explained by other macroeconomic indicators. The Durbin-Watson value is 2, showing that there was no autocorrelation in this model.

Most of the macroeconomic activity indicators turned out to significantly influence the NSX in the short run, except for money supply and real interest rates, as indicated in table 3.7. The direction of the relationship between the NSX and macroeconomic activities was only maintained for money supply and real exchange rate. The results suggested that they had a positive impact on the stock market in the short run, increasing the stock market by 0.04% and 2.15% if they change by 1%.

Industrial production will reduce the stock market by 1.84 % in the short run if there are any changes. The negative short-run impact on the stock market by industrial production was unexpected. Scholars such as Kolapo *et al*., (2018) and Joshi and Giri (2015) found a positive impact on their studies. The results in table 3.7 further suggest that inflation and real interest rate had a positive impact on the NSX. A 1% change in inflation or real interest rate would increase the stock prices by 0.11% and 0.01% respectively. The short-run positive impact on the NSX by inflation along with real interest rate is similar to the one found by Bist (2017), Kolapo *et al*., (2018) and Demir (2019). After having established the long-run and the short-run relationships between the NSX and the macroeconomic activities,

The ARDL model was tested for stability. First, the model was tested for serial correlation. The results are presented in Table 3.8 below.

Table 3.8: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.00	Prob. F(6,56)	0.38
Obs*R-squared	18.73	Prob. Chi-Square(6)	0.30

*Source: Author's compilation using EViews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

The serial correlation test was conducted to ensure that there was no serial correlation. It was conducted based on the null hypothesis that there is no serial correlation. The alternative hypothesis is that there is a serial correlation. The decision rule was made by comparing the probability value of the observed R-squared with the 5% level of confidence. If the probability value was greater than 5%, then we failed to reject the null hypothesis. In this case, the probability value (0.30) was greater than 0.05. We failed to reject the null hypothesis and concluded that there was no serial correlation.

The model was further tested for heteroscedasticity. Homoscedasticity was preferred in comparison to heteroscedasticity. The null hypothesis of homoscedasticity was tested against the alternative hypothesis of heteroscedasticity. The decision rule was made based on comparing the P-values of the F-statistics and that of the Chi-square to 5%. If the P-values were greater than 5%, then the null hypotheses would be rejected. The results of the heteroscedasticity test are presented in table 3.9 below.

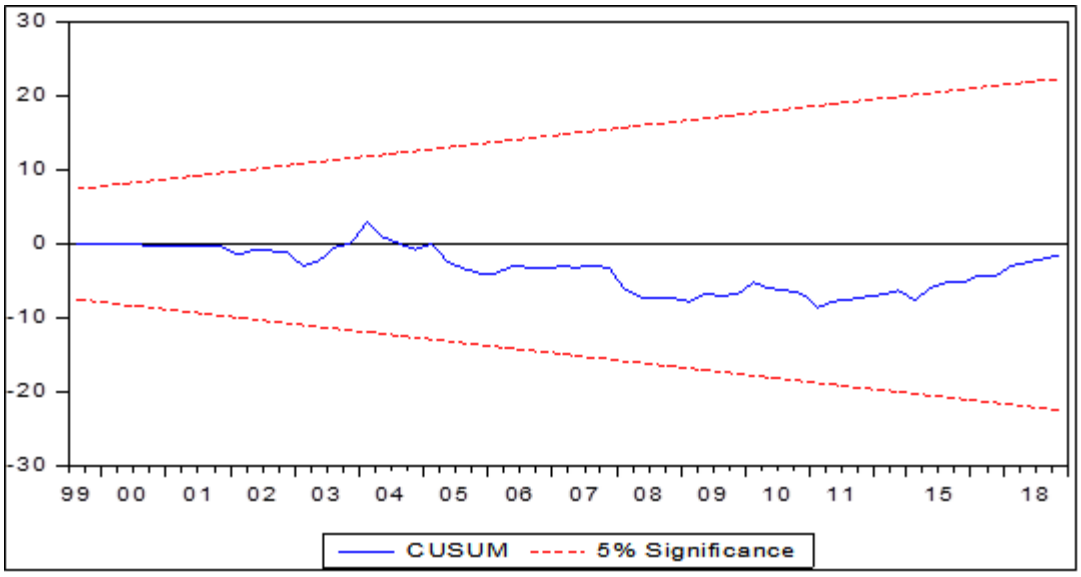
Table 3.9: Heteroscedasticity Test: White

F-statistics	7.86	Prob. F(14,62)	0.10
Obs*R-squared	49.25	Prob. Chi-Square(14)	0.12
Scaled explained SS	110.94	Prob. Chi-Square(14)	0.00

*Source: Author's compilation using Eviews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

The results in table 3.9 indicate that the P-values of the F-statistics (0.10) and that of the Chi-square (0.12) are greater than 0.05. This means the null hypothesis of homoscedasticity could not be rejected. The stability tests were also conducted on the model. The Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares (CUSUMQ) were conducted. If the plot lay within the bound of 5%, then the null hypothesis of coefficients was presumed to be stable, and the model was assumed to be stable (Lawal, Nwanji, Asaleye & Ahmed, 2016). The results are presented in figures 3.1 and 3.2 below.

Figure 3.1: CUSUM Stability Results

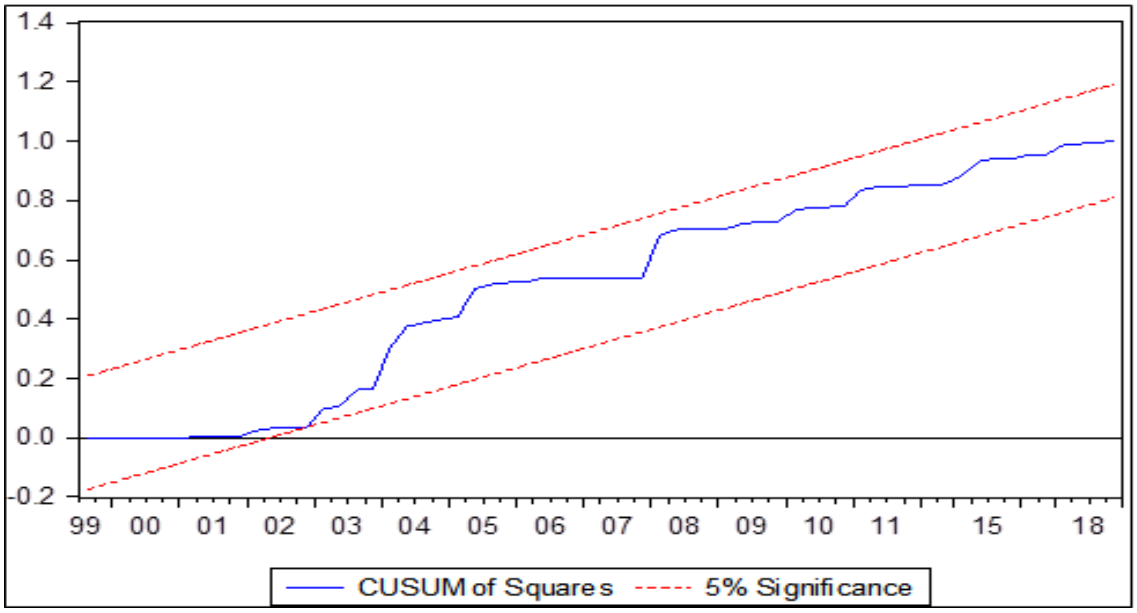


Source: Author's compilation using EViews.

The results of the CUSUM test in figure 3.1 above shows that the plot lies within the 5% bound. This is further backed up by the CUSUMQ test results in figure 3.2. below. The two tests indicated that the plots were well within the critical bounds, expected for both

the CUSUM and CUSUMQ. This means that the coefficients for the error correction model were stable (Bist, 2017).

Figure 3.2: CUSUMQ Test Results



Source: Author's compilation using EViews.

3.5.4 The Granger Causality Test

The Granger Test was conducted to assess the causal relationship between the NSX and the macroeconomic activities. The conclusion from the Granger causality results was made based on the comparisons between the probability variable and the level of confidence, which was 5% in this case. If the probability value was less than the level of confidence, then the null hypothesis of Granger causality could not be accepted. If the probability value was more than the level of confidence variable, the null hypothesis could not be rejected and noncausal relationships were assumed and the alternative hypothesis was rejected. The results of the causality test are presented in the table below.

Table 3.10: Pairwise Granger Causality Test Results

Null Hypothesis:	**Prob.**
LNIP does not Granger Cause LNSM	0.01**
LNSM does not Granger Cause LNIP	0.09
LNM2 does not Granger Cause LNSM	0.01**
LNSM does not Granger Cause LNM2	0.40
LNINFL does not Granger Cause LNSM	0.11
LNSM does not Granger Cause LNINFL	0.08
LNRIR does not Granger Cause LNSM	0.84
LNSM does not Granger Cause LNRIR	0.05**
LNRER does not Granger Cause LNSM	0.71
LNSM does not Granger Cause LNRER	0.39

*Source: Author's compilation using Eviews. Notes: ** means the rejection of the null hypothesis at 5%*

The results in table 3.10 show a unidirectional causal relationship between the Namibian Stock market and macroeconomic activities. The causal impact of macroeconomic activities on the Namibian Stock market is seen through industrial production and money supply. This is an indication that macroeconomic activities play a role in predicting the Namibian Stock market through stock prices. The results suggested that inflation, real interest rates and real exchange rates did not predict the stock prices in the Namibian Stock market. The Namibian Stock Market Granger caused the macroeconomic activities in Namibia, as indicated in the results above. The results indicated that the Namibian Stock Market can predict macroeconomic activities through real interest rates. The unidirectional causality between the stock market and the macroeconomic activities is similar to the results found by Acikalin *et al*., (2008) in the Turkey economy, as well as those found by Tiwari *et al*., (2015) on the Indian economy.

3.6 Summary

The objective of this section of the study was to test for the relationship between the Namibian Stock Market and the macroeconomic activities using quarterly data between 1995 and 2018. To achieve this objective, three specific objectives were tested. The first specific objective was to test for the presence of volatility in the Namibian Stock Market using the GARCH/EGARCH models. The results revealed that there was no volatility in the Namibian Stock Market. The second specific objective was to test for the short- and long-run relationships using the ARDL and the ARDL-based ECM. The results suggested that there was a long-run relationship between the Namibian Stock market and the macroeconomic activities.

The results revealed both a positive and negative relationship between the Namibian Stock market and macroeconomic activities. Macroeconomic activity variables, specifically industrial production, money supply and real exchange rates, had a positive long-run relationship with the Namibian Stock Market, while inflation and the real interest rate, on the other hand, showed a negative relation. The ARDL-based ECM revealed that the macroeconomic activity indicators considered, converge in the short run to bring about a long-run equilibrium in the Namibian Stock Market.

The causal relationship between the stock market and the macroeconomic activities in Namibia was also tested as a third specific objective. A unidirectional causal relationship between the Namibian Stock Market and the macroeconomic activities was concluded. The results suggested that not all the macroeconomic activities considered can help explain the Namibian Stock Market directly. Only industry production and money supply were able to predict the stock prices. It was further observed that the stock market can also

help explain the macroeconomic activities in Namibia through the real interest rate and nothing else.

Chapter Four: The Relationship between the Foreign Exchange Market and Macroeconomic Indicators

4.1 Introduction

This chapter deliberates the relationship between the foreign exchange market and the macroeconomic indicators in Namibia. This chapter is outlined as follows: first, the background to the foreign exchange market and the macroeconomic indicators is discussed. This is where the generally known relationship between the foreign exchange market and the five selected macroeconomic indicators is outlined.

The second part of this chapter is the literature review. Under this subsection, theoretical together with empirical literature related to foreign exchange markets and macroeconomic indicators is analyzed and referred to. The third subsection of this chapter outlines the methodology. This is where the methodology and the procedures that were used to answer the specific objectives of this study are defined and explained.

The fourth subsection of this chapter is empirical results. The results from the tests and procedures explained under the methodology are presented in this section. The objectives of this chapter are also answered here. The fifth and last subsection is in conclusion. This is where the summary of this chapter together with the findings are conferred.

4.2 Background of the Foreign Exchange Market and Macroeconomic Indicators

Naturally, macroeconomic activities are influenced by many factors of which some are internal while others are external. Among the factors that transmit the impact on macroeconomic activities is the foreign exchange market. This is the market where currencies are traded at a given exchange rate (Parkin, 2014). The foreign exchange

market is one of the important asset markets in an economy, and it is important to consider when designing macroeconomic policies (Guzman, Ocampo & Stiglitz, 2018). For an economy to trade with other economies, an exchange of currencies is needed. According to Gradojevic, Erdemliogh and Gengay (2017), the foreign exchange market, through the exchange rate, influences macroeconomic activities via trade.

The real exchange rate is one of the major players in the foreign exchange market has a significant impact on the price levels as well as on the international trade balances of the domestic economy. According to Abimelech, Zhen, Presley and Isaac (2017), fluctuations in the level of the real exchange rate might bring uncertainty regarding the firm's profits. This specifically applies to the firms that trade and have transactions dominated by foreign currencies.

Exchange rate volatilities divert investments from the domestic economy towards economies with less volatile exchange rates. This is because the risk to an investor is lower when the exchange rate is less volatile. The exchange rate is, therefore, a very important foreign exchange market indicator, especially for open economies. The Namibian economy is one of those economies that rely heavily on trade, thus the foreign exchange market is a very important tool to consider when making macroeconomic policies.

The foreign exchange market can be influenced by many factors, some monetary, while others are non-monetary (Calderon & Kubota, 2017). However, at most, the influence of the foreign exchange market on the macroeconomic activities is reflected through the balance of payment of an economy (Guzman, Ocampo & Stiglitz, 2018). Although the impact of the exchange rate is reflected in all the accounts in the balance of payment, the most important account, in comparison to the others, in the balance of payment is the

current account. This is where trade is recorded and that is where the foreign exchange market, through the exchange rate, is at most crucial.

Changes in the exchange rate bring about fluctuations in the level of exports and imports of goods and services in an economy. The exchange rate is known to have a negative impact on the volume of exports of an economy, with a positive influence on imports (Parkin, 2014). An increase in the exchange rate brings about an appreciation of the domestic currency. When the domestic currency appreciates, it becomes strong and costly. When this happens, the trade partners of the domestic economy will not be in a position to buy the exact bundle of goods and services they usually buy. In return, the volume of exported goods and services of the domestic economy will fall.

An appreciation of the domestic currency, on the other hand, will increase the demand for imports in the domestic economy. This is because the local economic agents will find foreign goods and services cheaper. An increase in foreign goods and services consumption increases the volume of imports in the local economy. In the end, fluctuations in the foreign exchange markets affect the level of trade, both in the domestic economy and that of its trading partners (Blanchard, 2011).

The foreign exchange market, through the real exchange rate, also influences domestic macroeconomic activities through the level of productivity (Romelli, Terra & Vasconcelos, 2018). This is mainly because the changes in the real exchange rate influence the decisions of the firms (Forbes, Hjortsoe & Nenova, 2017). Most firms import goods and services that they sell along with those that they use in production. If there is an appreciation in the domestic currency, the goods and services would be cheaper, and they would buy a lot of stock. For firms that use imported goods and services for

production, this will increase the level of production and output. This will also bring about a change in the price level as per the law of supply. This being the case, the impact of the foreign exchange market is reflected through the change in production as well as the price level of the economy.

The foreign exchange market is not only in existence for trade purposes, but it also serves as a place for investors and speculators to do business (Parkin, 2014). One of the reasons monies is demanded is for speculative purposes. On the one hand, some speculators prefer gambling with exchange rates in the foreign exchange market. On the other hand, economic agents also use the currencies to buy and to sell financial assets that are traded at a price level that depends on the interest rate (Parkin, 2014). The level of interest rate determines the amount of profit an investor can make on a financial asset. This is due to the negative relationship between asset prices and the interest rate.

Every economy has its objectives and developmental agendas; thus its level of interest rate is most likely to be different. Investors in the foreign market lookout for changes in the level of interest rates in economies, which informs their decisions on where and when to invest. An increase in the domestic interest rate, for instance, other factors being the same, will attract investors. This in return will bring about an increase in the demand for domestic currency. The exchange rates will change and subsequently, change the level of interest rates in the domestic economy. Changes in the level of interest rate might bring changes in the level of investment in the domestic economy. The foreign exchange market can thus be reflected through interest rates and investment in the local economy (Alagided & Ibrahim, 2017).

Changes in the demand and supply of currency also have an impact on the level of money supply in an economy. This is mainly because the demand for one currency is the supply of another currency (Parkin, 2014). This simply means that if an individual demand foreign currency, they must be able to give up an amount of their domestic currency, equivalent to the amount of foreign currency that the individual is demanding. These changes in demand and supply of currency change the amount of both money demanded and money supply in the economies by default (Parkin, 2014). For instance, if there is an increase in the level of interest rate in the domestic economy, demand for the domestic economy will increase. This will in turn decrease the supply of the local currency. Changes in the supply of currency can therefore be used as a reflector of foreign exchange on the local macro-economy. The impact of macroeconomic activities on the foreign exchange rate market can also be reflected by the money supply.

The discussion above indicates that there is a link between the foreign exchange market and macroeconomic activities in general. This link can be reflected through exchange rates, industrial production, investment, the quantity of money and trade. The selected macroeconomic indicators have been fluctuating over time between 1995 and 2018, as indicated in chapter two. Additionally, the real effective exchange rates have also been fluctuating between 1995 and 2018. Theory indicates that there is a link between the macro-economy and the foreign exchange and the selected macroeconomic activity variables, thus this study aimed to quantify this theory in the Namibian context.

Furthermore, Namibia is one of the economies that rely heavily on trading primary commodities. The prices of such commodities are likely to be volatile due to changes in the foreign exchange market. It was further noted that most of the exchange policies

conducted in the Namibian economy depend on those done by South Africa since Namibia is part of the CMA. This is an indication that the Namibian foreign exchange might be exposed to external forces, and it might be faced with volatilities.

Since Namibia is an open economy, the foreign exchange market is very important, and it needs to be considered when making policies for the local economy. Similarly, the macroeconomic activity indicators might help outline the policies that govern the Namibian foreign exchange. It is against this background that this chapter of the study aimed to analyze the relationship between the foreign exchange market and the macroeconomic activities in Namibia. Specifically, this chapter of the study tested for the presence, persistence and symmetric effect of volatility in the Namibian foreign exchange market in the first place. Secondly, to assess the effect of macroeconomic activities on volatility in the foreign exchange market in Namibia. Lastly, to analyze the nature of the relationship between the foreign exchange market and the macroeconomic activities for Namibia.

4.3 Literature Review on the Relationship between the Foreign Exchange Market and Macroeconomic Indicators

There are several theories and empirical studies that link the foreign exchange market to macroeconomic indicators. This part of the chapter reviews literature that links the foreign exchange market to the selected macroeconomic activity indicators. Firstly, the theoretical literature is reviewed, after which the empirical literature follows. They are discussed in that exact order as follows:

The relationship between the foreign exchange rate and the macroeconomic indicators has been hypothesized by a lot of scholars, for instance, Friedman (1953) stated that there is a long-run relationship between macroeconomic stability and the exchange rate. Friedman believed that volatilities in the real exchange rates can bring about fluctuations in the macroeconomic environment in the long run. This means that the two variables have a direct relation, which according to Morana (2009) is negatively related, such, that correcting macroeconomic instabilities is done at the cost of the exchange rate. On the positive side, Gervais, Schembri and Suchanek (2016) argued that the foreign exchange market helps stimulate the domestic economy. This is mainly done through the exchange rates, as it adjusts in response to shocks from external factors.

Other scholars such as Dornbusch (1976) stated that the impact of the foreign exchange market on macroeconomic indicators can be reflected through capital mobility in the economy. This relationship takes place through changes in the financial asset prices as well as from shocks in the money supply. For example, if the domestic economy experiences shock in the quantity of money supplied, the impact is most likely to be reflected in the prices and returns in the financial assets such as bonds in both the foreign and the domestic economies (Calderson & Kubota, 2017).

Calderson and Kubota (2017), further went on to state that shocks in the real exchange rates can be reflected in the trade structure of an economy and also the type of capital flow the economy faces. Although this might be the case, the negative relationship between the foreign exchange market (through exchange rates) and the macroeconomic activities (through trade) still prevails. For economies with weak economic structures, the shocks in

the real exchange rates are weaker in comparison to economies with stronger trade structures.

In line with the purchasing power parity theory, Devereux (1997) stated that fluctuations in the real exchange rate can be traced to movements from aggregate demand shocks, while Chatterjee and Mursagulov (2012) argued that the real exchange rate is linked to government expenditure via the balance of payment. This stems from the fact that government spending also depends on the balance of payment, specifically on the current account balance (Kim, 2015). For example, a surplus or a deficit realized by the balance of payment determines the route the government is to follow in terms of borrowing, lending and spending.

On the downside, real exchange rate fluctuations also cause fluctuations in government spending in the form of reduced spending due to depreciation in the domestic currency. The government spends on both traded and non-traded goods and services, and appreciation of the domestic currency increases government expenditure on non-traded goods and services, which in turn induces an increase in their relative price level (Chatterjee & Mursagulov, 2012). Although this is the case, Kim (2015) stated that government expenditure also depends on the level of international capital mobility, especially for economies that receive foreign direct investments. The intricacies here is that the level of foreign direct investments in turn also depends on the real exchange rate. Thus, as long as there are shocks in the real exchange rate, those shocks will be reflected in the level of government expenditure.

Lastly, the Mundell-Fleming Model also links the macroeconomic indicators to the exchange rate through the IS-LM Model (Froyen, 1996). The IS-LM Model links the

goods and services market to the financial market. This is done to determine the equilibrium output and interest rate. For an open economy, this model can also be used to determine the level of exchange rates via fiscal and monetary policies (Blanchard, 2011). Specifically, fiscal policy occurs through a change in government expenditure or a change in the level of tax, while monetary policy is done through a change in money supply (Dornbusch, Fischer & Startz, 2004).

Changes in the three variables can result in changes in the level of output, interest rate and exchange rates in an open market. For instance, an increase in government spending, other factors being the same, leads to an increase in the level of interest rate, through the shifts in the IS-LM curve. This increment makes the domestic currency more attractive to investors, hence, they would want to invest in the domestic economy. This in turn will increase the exchange rates and bring about an appreciation of the domestic currency. The same goes for the monetary policy, an increase in the quantity of money supply creates a chain reaction that increases the level of exchange rates through the level of interest rate, other things being the same (Dorinbusch, *et al*., 2004, Blanchard 2011).

The discussion of the theoretical literature revealed the following: firstly, the exchange rate is volatile. Secondly, macroeconomic variables affect exchange rate volatilities. Lastly, there is a relationship between macroeconomic indicators and the exchange rate market through various mechanisms. This might also apply to the Namibian economy, thus this study's aim to investigate this relationship. Supporting the aforementioned hypotheses are empirical studies as presented below.

For the first objective of this study, some studies tested for the presence of volatility in the foreign exchange market through the exchange rates. For instance, Chong, Chun and

Ahmad (2002) conducted a study by modelling the volatility of the currency exchange rate using the generalized Autoregressive Conditional Heteroscedasticity (GARCH) Models in Malaysia. They found the exchange rates in Malaysia to be volatile and persistent, the reaction most likely brought about by the supply and the demand of the currency. Similarly, Neely (2011) examined the effects of announcements on the foreign exchange rate volatility and jump in the US. The GARCH/EGARCH model was used to test for volatility and found a presence of volatility in the exchange rates. Using the same methodology, Pacelli (2012) conducted a study on the daily exchange rates of the Euro and the US between 2003 and 2009. The results also revealed the presence of volatility in the exchange rate.

Nnamdi and Ifionu (2013) also conducted a study on exchange rate volatility and uncertainty in Nigeria. Using the annual data between 1970 and 2011, the author employed the ARCH/GARCH Model to test for volatility that was found. They also discovered that the exchange rate uncertainty was directly related to the current exchange rate in Nigeria. Similarly, in Europe, Todea and Platon (2012) conducted a study on volatility in the exchange rate using the GARCH model on data between 1999 and 2009. The findings revealed the presence of volatility in the exchange rate.

In South Africa, Mokoma (2015) conducted a study on exchange rate volatility using quarterly data between 1990 and 2014. The ARCH (1), GARCH (1, 1) and GARCH (1, 2) Models were used and found a presence of volatility in the exchange rate. In a separate case, Kandora and Hamdi (2016) modelled and forecasted exchange rate volatility for Sudan. The study employed an ARCH/GARCH Model to test for volatility on monthly

data for the period 1999 to 2013. The findings revealed the presence of volatility and the clustering as well as leverage effects in the exchange rate market.

With a more recent study, Omari, Mwita and Waitutu (2017) estimated the USD/KES exchange rate volatility in Kenya using daily data for the period 2003 to 2015. The study estimated the GARCH, GARCH-M and the EGARCH Models were conducted. They found the presence of the ARCH effects as well as the volatility clustering effect in the Kenyan foreign exchange market. On the contrary, Ganbold, Akram and Lubis (2017) also conducted a study on exchange rate volatility using the ARIMA, SARIMA on daily data covering the period 2005 to 2017. The study found no presence of the ARCH effects, implying that there was no presence of volatility.

Theoretical literature also revealed that macroeconomic variables impact exchange rate volatility, which is the second objective of this study. Therefore, it is important to review those studies to establish empirical grounding for this study. For example, Lee-Lee and Hui-Boon (2007) adopted the E-GARCH methodology to test for volatility and subsequently applied the Autoregression Distributive Lag Model (ARDL) using monthly data for the period 1980 to 1998 for the ASEAN economies. The study found a link between the macroeconomic factors and the exchange rate volatility in both the short run and the long run.

Also, Bobai, Ubangida and Umar (2013) assessed the relationship between the exchange rate volatility and inflation in Nigeria. The Vector Error Correction Model (VECM) was applied to annual data covering the period 1986 to 2010. As a norm, the ARCH and GARCH Models were used in testing for the presence of volatility in exchange rates, which was the case. The study further showed a relationship between inflation and

exchange rate volatility. More evidently, a study by Dlamini (2014) in Swaziland revealed that positive shocks in macroeconomic activities led to an increase in exchange rate volatility. This relationship was explored using the Structural Vector Autoregression (SVAR) modelling technique on data for the period 1990 to 2013, while the GARCH and TGARCH were used to assess the presence of volatility in the exchange rate.

Abimelech et al. (2017) tested for the causal effects and dynamic relationship between the exchange rate volatility and macroeconomic development in Liberia. They used the GARCH/ARCH models to test for volatility, while the Vector Autoregression (VAR) approach was used to assess the dynamic relationship utilizing annual data for the period 1980 to 2015. They found that innovations in economic growth led to exchange rate volatility. All these studies provide evidence of the effect of macroeconomic factors on the volatility of exchange rates.

Apart from testing for volatility in the exchange rates as well as the impact of macroeconomic factors on volatilities, some studies assessed the relationship between the foreign exchange market and the macroeconomic factors, which was the third objective of this study. Amongst these studies is the study by Dumrongrittikul and Andreson (2016) who assessed the effect of domestic factors on the real exchange rate in Asian developing economies. The study employed a panel structural VECM methodology on data covering the period 1970 to 2008 and found that the real exchange rate responded to monetary tightening. In the long run, the macroeconomic variables, such as real GDP had an impact on the level of the real exchange rate in the developing economies considered.

Similarly, Su (2012), in a study done in China, revealed a long-run relationship between the exchange rate and macroeconomic variables. In this study, a threshold error correction

model (TECM) was applied to quarterly data for the period 1994 to 2010. Supporting the previous findings was the study by Chang and Su (2014) who conducted a study on the dynamic relationship between exchange rates and macroeconomic fundamentals in the Pacific Rim countries. A VECM was utilized on quarterly data covering the period 1986 to 2011 and revealed a long-run relationship between the macroeconomic activity and the exchange rate.

In Uganda, Katusiime, Agbola and Shamsuddin (2016) conducted a study on macroeconomic and market microstructure modelling on the Ugandan foreign exchange market. The authors used monthly data for the period 1995 to 2013 with an ARDL modelling approach. The results showed that there was a long-run, positive relationship between the real exchange rate and macroeconomic variables. The macroeconomic activity variables in Uganda turned out to be the key determinants of the real exchange rate dynamics in the long run, while in the short run the dynamics in the real exchange rate were derived by the global financial crisis instead of the domestic economy.

Other authors also looked at this subject matter from developed countries, which is relevant to compare any similarities with the findings from developing countries. For instance, Yin and Li (2014) conducted a study on the macroeconomic fundamentals and the exchange rate dynamics using a non-arbitrage macro-finance approach. They focused on the US and Euro Area (EA) using monthly data for the period 1999 to 2008. The study revealed that macroeconomic innovations helped to capture the innovations in the exchange rates. Most importantly, macroeconomic fundamentals influenced the exchange rates through the time-varying market prices, and their shocks had a time-varying impact on real exchange as well.

In the same line, Manalo, Perera and Rees (2015) also conducted a study on exchange rate movements in the Australian economy using the structural VAR on quarterly data covering the period 1985 to 2013. The findings showed that the real exchange rate had stabilizing effects on the domestic economy, which can be explained by the macroeconomic fundamentals such as inflation, sectoral production, real gross domestic product and terms of trade.

In another cross-country study, Kim (2015) piloted a study on exchange rates as well, looking at the country characteristics and the effects of the government consumption shocks on the current account and the real exchange rates. Kim used a sample of 18 countries and adopted the structural VAR methodology. The study revealed that government consumption was significant in determining the level of the real exchange rate in the foreign exchange market. Also, exchange rates played a role in government consumption influences on the current account in the balance of payment. This relation was mostly observed through international capital mobility that has a huge impact on government consumption in an economy.

Abimelech *et al*., (2017) tested for the causal effects and dynamic relationship between the exchange rate volatility and macroeconomic development in Liberia. They used the GARCH/ARCH models to test for volatility, while the Vector Autoregression (VAR) approach was used to assess the dynamic relationship utilizing annual data for the period 1980 to 2015. They found that innovations in economic growth led to exchange rate volatility. Furthermore, changes in the real exchange rate are mostly reflected in the macroeconomic variables through the trade balance.

Similarly, Alagided and Ibrahim (2017) also assessed the causes and effects of the exchange rate volatility on the economic growth in Ghana. Using annual data covering the period 1980 to 2013, they adopted the GARCH model to test for volatility in the exchange rate market. In addition to that, they further adopted the co-integration test to test for the long-run relationship between the variables considered. They found that in the short run, fluctuations in real exchange rates were brought about by the level of output in the economy. They also discovered that in the long run, some macroeconomic activity variables such as government expenditure, money supply, terms of trade, foreign direct investment and inflation, brought about volatility in the foreign exchange market through the real exchange rates.

In Namibia, there are very few studies with specific emphasis on the relationship between exchange rate and macroeconomic indicators. One such study is by Eita and Sichei (2006) who estimated the real exchange rate equilibrium in Namibia for the period 1970 to 2004. The study adopted the VECM approach. They found that terms of trade which is one factor known to have an impact on the real exchange rate had no impact in the Namibian context. Moreover, the study further revealed that trade openness, terms of trade and ratio of investment to GDP had no role in returning the real exchange rate to equilibrium, thereby suggesting a none long-run relationship.

In support of the previous findings in the study by Wilson and Sheefeni (2014) that also examined the link between foreign exchange markets and macroeconomic activities. Particularly, this study looked at the relationship between the interest rate and the real exchange rate. Using quarterly data covering the period 1993 to 2012, a VAR modelling approach was used and found no long-run relationship between the two variables.

Moreover, the study found no clear systematic relationship between the variables because the shocks from both the interest rate and inflation are short-lived.

Overall, there was evidence of the relationship between the foreign exchange market and macroeconomic indicators. Given the fact that the last relatable study was by Wilson and Sheefeni (2014), can the same still be said about Namibia? This is the question at the centre of this chapter that intended to fill the literature gap. Furthermore, this study differs from that of Wilson and Sheefeni (2014) in the sense that this part of the study adopted the ARCH and GARCH models to test for volatility. Volatility was tested against the macroeconomic activity indicators using the ECM approach, which Wilson and Sheefeni (2014) did not use. Additionally, the study made use of data between 1995 and 2018, filling the six years gap from 2012.

4.4 Methodology

4.4.1 Model Specification and Econometric Framework

To assess the relationship between the foreign exchange market and the macroeconomic indicators in Namibia, this chapter adopted two methodologies to achieve the three specific objectives. The specific objective of testing the presence of volatility in the foreign exchange market was achieved through the estimation of the ARCH/GARCH models. The second and third specific objectives were to assess the short- and long-run relationship between volatility, the foreign exchange market together with macroeconomic activity indicators. They were achieved by using the Residual Based approach by Engle and Granger (1987) and the Error Correction Model (ECM). The techniques are discussed according to the objectives in the next subsection.

The first specific objective of this chapter was to test the presence of volatility in the foreign exchange market. This stemmed from the fact that the real exchange rate was mostly volatile (Devereux, 1997). According to Chong et al., (2002), the squared returns on speculative price data/series at most exhibited autocorrelation in the errors and tended to cluster together, a phenomenon known as volatility clustering. As discussed in chapter three, the Autoregressive Conditional Heteroscedasticity (ARCH) Model by Engle (1982) and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) Model by Bollerslev (1986) can be used to test for volatility. A similar model was adopted to assess for the presence of volatility in the Namibian Foreign Exchange Market.

To assess for volatility in the Namibian Foreign Exchange Market, an ARCH/GARCH model like the one used by Neely (2012) and Dlamini (2014) was adopted. They assumed that the conditional mean for estimating the real exchange rate is usually given by the following model:

$$q_t = E(q_t | \cap_{t-1}) + e_t \qquad 4.1$$

where the q_t are the returns on the exchange rates, $\cap_{t-1}$ is the information set at time t-1, $E(.|.)$ represents the conditional expectation operator, while e_t is the disturbance term. The conditional variance that generated the ARCH process can be expressed as:

$$\partial_t^2 = \cup_0 + \sum_{i=1}^{n} \cup_i e_{t-i}^2, \text{ such that } e_t | \cap_{t-1} \sim N(0, \partial_t^2) \qquad 4.2$$

where ∂_t^2 represents the conditional variance, and $\cup_i \geq 0$ for all $i = 1,2,3 \ldots n$, while $\cup_1 + \cdots \cup_n < 1$ to make e_t^2 stationary and positive. Assuming that the dependent variable is A, the ARCH model is thus expressed as:

$$A_t = \propto_0 \sum_{i=1}^{k} \propto_i A_{t-1} + e_t \qquad 4.3$$

To include the terms of the lagged conditional variance, the GARCH Model is expressed as:

$$\partial_t^2 = \cup_0 + \sum_{i=1}^{n} \emptyset_i \partial_t^2 + \sum_{j=1}^{m} \cup_i e_{t-1}^2 \qquad 4.4$$

such that the value of ∂_t^2 depends on the past shocks as well as the past values of itself, which is captured by the lagged term (Dlamini, 2014). The sum of $(\cup + \emptyset)$ governs the persistence of the volatility shocks if there is any and shows whether they are strong or otherwise.

According to Dlamini (2014), the ARCH/GARCH Models are restricted to absolute values and not the signs. Thus, it is hard to differentiate the impact from positive and negative shocks, since they yield the same results. However, the impact of negative shocks and those from positive shocks are not the same. Therefore, to capture the asymmetries in terms of positive and negative shocks, the Threshold GARCH (TGARCH) Model by Glosten, Jagannathan and Runkle (1993) was adopted and it is expressed in the following general form:

$$\partial_t^2 = \cup_0 + \sum_{i=1}^{n} (\cup_i + \emptyset_i d_{t-1}) e_{t-1}^2 + \sum_{j=1}^{m} \propto_j \partial_{t-j}^2 \qquad 4.5$$

such that d_t is 1 for $\cup_t < 0$. Positive shocks are reflected in the model $\cup$, while the negative impact is reflected through $(\cup + \emptyset)$. If $\emptyset = 0$, the impact is symmetric, and if $\emptyset > 0$, there is asymmetric impact. The same exercise was repeated with the EGARCH Model to confirm the results of the TGARCH. The EGARCH adapted was that by Lee-Lee and Hui-Boon (2007) and was expressed as:

$$\log(q_t) = \omega_0 + \sum_{i=1}^{n} \beta_i g(v_{t-i}) + \sum_{j=1}^{m} \delta_j \log(q_{t-j}) \; such\ that\ H_t = \cup$$

$$+e, e_t|\emptyset_{t-1} \sim N(0, q_t) \qquad 4.6$$

where ω_0 and $\cup$ are constants; $f(v_t) = \partial v_t + \cup [|v_t| - E|v_t|] \; and \; v_t = \frac{e_t}{\sqrt{q_t}}$ 4.7.

where m is the order of the autoregressive process and n is the order of the moving average. v_t is expected to be negative, while the conditional variance of q_t is expected to react asymmetrically to the magnitude of the innovations in v_{t-i}. The volatility in the exchange rate was used to capture any uncertainties that the economic agents faced through trading.

The second specific objective of this chapter was to test whether macro-economic activities influenced volatility in the Namibian context. If a presence of volatility in the foreign exchange market was detected, a model similar to the one by Kilicarslan (2018) was estimated and specified as:

$$VOL_t = \beta_0 + \beta_1 IP + \beta_2 M2 + \beta_3 I + \beta_4 TOT + \beta_5 GRNE + u_t \qquad 4.8$$

where the volatility is going to be the regressand (dependent variable), while the industrial production, money supply, investment, terms of trade and government expenditure are the regressors (independent variables) representing the macro-economic activities.

As stated earlier, the error correction modelling strategy was employed. The study made use of time series data, which does not always vary systemically over time. Their statistical properties depend on time, hence there was a need to test for stationarity.

Therefore, the first step before the ECM Models was to test for the presence of unit root (non-stationarity) in the data. Similar to chapter two, this chapter also adopted the Phillips-

Peron (1988) and the Kwiatkowski Phillips Schmidt Shin (KPSS) by (Kwiatkowski, Phillips, Schmidt & Shin, 1992) to test for stationarity. The PP and the KPSS follow equations 3.10, 3.11 and 3.12 that are estimated in chapter three.

The PP still tested the null hypothesis of non-stationarity, with the alternative hypothesis postulating stationarity. The decision was made by comparing the calculated values with critical values. The KPSS test also tests for the null hypothesis of stationarity against the alternative hypothesis of non-stationarity. The decision rule was made by comparing the critical values against the calculated values, as discussed in chapter three.

After the unit root tests, the next step was to estimate the long-run equilibrium relationship. A residual was created from the estimated long-run equilibrium equation. The residual was then tested for stationarity, and it was preferred that the residual be stationary in level form for one to assume co-integration. Thus, the decision of co-integration was done based on the residual, ε_t such that:

$$\Delta\hat{\varepsilon}_t = \delta\hat{\varepsilon}_{t-1} + u_t \qquad 4.9$$

where $\hat{\varepsilon}_t$ is the residual from the regression equation, hence the name residual-based approach to co-integration. δ is the parameter of interest, while u_t is the error term. If the residual represented by equation 4.9 was stationary in levels, then there was co-integration and the opposite applied.

According to Brooks (2008), the stationarity of the residual can be tested using either the ADF test or the PP or KPSS tests. It follows that the presence of co-integration warrants the estimation of the ECM to determine the long run while taking into account the short-

run dynamics between volatility in the foreign exchange market and the macroeconomic indicators. The ECM was adopted based on the following equation:

$$\Delta VOL_t = \beta_0 + \beta_1 \Delta LNIP_t + \beta_2 \Delta LNM2_t + \beta_3 \Delta LNI_t + \beta_4 \Delta LNTOT_t + \beta_5 \Delta LNGRNE_t + \sigma \vartheta_{t-1} + \cup_t \quad 4.10$$

where the abbreviations and description of variables are defined in equation 4.8 above. VOL represents volatility, as a dependent variable, in this case, while ϑ_{t-1} is the lagged value of the error term. The coefficient of the lagged error term was expected to be negative for it to capture the long-run relationship in the equation, and it showed how fast the equilibrium was restored. The coefficient must be between the ranges of 0 to -1, but even 2 was acceptable because the convergence was oscillation and it depended on the shocks.

The third and last specific objective of this chapter was to establish the short- as well as the long-run relationship between the Namibian Foreign Exchange Market and the macroeconomic indicators using the ECM. To capture the relationship between the foreign exchange market and the macroeconomic indicators, the study adopted the following simple model:

$$RER = f(IP, M2, I, TOT, GRNE) \quad 4.11$$

where RER is the real effective exchange rate, which represents the foreign exchange market; IP is industrial production; M2 is the money supply; I is investments; TOT is the terms of trade and GRNE is the government expenditures. This simple model can be transformed into an exchange rate equilibrium function like the one adopted by Su (2012) that is expressed as:

$$RER = \propto + \beta_1 IP + \beta_2 M2 + \beta_3 I + \beta_4 TOT + \beta_5 GRNE + \cup \quad 4.12$$

where the variables are defined in equation 4.12; $\propto$ is the constant, $\beta_1 \ldots . \beta_5$ are coefficients, while $\cup$ is the error term. This equation was used to forecast the behaviour of exchange rates with the macroeconomic variables considered. The study adopted an error correction model similar to the one used by Kikuchi (2004) as well as the one by Udoh, Akpan, John and Patrick (2012), thus, equation 16 can be expressed as an ECM with variables rewritten in natural logarithms as:

$$\Delta RER_t = \propto_1 + \beta_1 \Delta LNIP_t + \beta_2 \Delta LNM2_t + \beta_3 \Delta LNI_t + \beta_4 \Delta LNTOT_t + \beta_5 \Delta LNGRNE_t + \alpha_2 \cup_{t-1} + \varepsilon_t \quad 4.13$$

where $\propto_1$is the constant, $\beta_1 \; to \; \beta_5$ are the short-run coefficients, α_2 is the coefficient of the estimated lagged value, $\cup_{t-1}$ is the lagged value of the error terms, while ε_t is the white-noise error term.

4.4.2 Data and Data Sources

The study made use of quarterly data between 1995 and 2018 to assess the relationship between the foreign exchange market and the macroeconomic indicators in Namibia. The data was collected from the Bank of Namibia and the Namibian Statistics Agency. This chapter made use of six variables in total, adopting the real effective exchange rate as the independent variable and as a proxy for the Namibian foreign exchange market. Industrial production, money supply, investment, terms of trade and government expenditure were used as independent variables. Furthermore, the five independent variables were used as proxies for macroeconomic indicators in Namibia.

4.4.3 Justification and Measurement of the Variables

Real Exchange rate

The foreign exchange market is a place where currencies are traded at a specific exchange rate. An exchange rate is an important tool in the foreign market because it facilitates the demand and the supply of currencies. Most economies trade with each other, competing with each other for goods and services as well as for financial resources through the foreign exchange market. For an open economy such as Namibia, the exchange rate plays an important role. It is against this background that it can also be used as a proxy for the foreign exchange market as used by Akosah, Mireku and Owusu-Afriyie (2018) and Alagided and Ibrahim (2017) in their studies on foreign exchange markets. A real effective exchange rate was used, and it was expected to have had a positive impact on some macroeconomic indicator variables, whilst negatively influencing some others. The data was obtained from the Bank of Namibia.

Industrial Production

Industrial production is output per industry in an economy. Since Namibia is an open economy, its exports depend highly on the total output, which will be reflected in the foreign exchange market. Furthermore, variations in industrial productivity had an impact on other macroeconomic activities such as employment and inflation, amongst others. For instance, improvements in industrial productivity increase employment, improving the living standards of the society.

Industrial production is, therefore, one of the important macroeconomic indicators that can be reflected through the foreign exchange market and might reflect the foreign

exchange market in the macroeconomic activities as well. Scholars such as Su (2012), Manalo *et al*., (2015) amongst others, used it as a macroeconomic indicator in their studies on foreign exchange markets. Industrial production is expected to have a positive impact on the foreign exchange market. Data for industrial production was collected from the Namibian Statistics Agency. Industrial production is expressed in real terms, valued in millions of Namibian dollars.

Money Supply

The money supply is the amount of currency outside the depository institutions, excluding the deposits (Bank of Namibia, 2017). Generally, it is the amount of money injected into the economy by the central bank at a given point in time. Money supply reflects the innovations in the amount of output, the real interest rate and the price level of an economy. Furthermore, the amount of money supply determines the level of imports in an economy, since it represents the purchasing power of the local economic agents. It is an important macroeconomic indicator, such that scholars such as Alagided and Ibrahim (2017), Su (2012) along Chang and Su (2014) used it as a macroeconomic indicator in their studies on foreign exchange markets. The data on money supply was collected from the Bank of Namibia and it was expected to have a negative impact on the foreign exchange market. The total quantity of money supply was expressed in Namibian dollars.

Investment

Investment is defined as the purchase of goods and services by the firms (Parkin, 2014). This categorizes the purchase and repair of new and old business goods. Investment can also be looked at as a purchase of financial assets, such as bonds and houses, amongst

other things. Investment depends highly on income and interest rates, such that an increase in income increases it, whilst interest rate reduces it. Also, investment is one of the variables that make up the gross domestic product, thus it is an important macroeconomic indicator in the financial market. Giri and Joshi (2017) in their study indicated that investment, through foreign direct investment, is an important macroeconomic indicator. Furthermore, Beltratti and Morana (2010) used it as one of the macroeconomic indicators in their study on the foreign exchange market. Investment is expressed in real terms, in millions of Namibian dollars and is expected to have a positive impact on the foreign exchange market. Data for investment was obtained from the Namibian Statistics Agency and it was measured in Namibian dollars.

Terms of Trade

An open economy trades and interacts with the rest of the world through its exports and imports, which is the trade of goods and services. Namibia depends on trade when it comes to goods and services, as well as financial assets. Terms of trade is simply a ration of exports against imports, weighing the trading pattern of the Namibian economy against its trading partners. It is obtained using the following formula:

$$ToT = \left({Exports}/{Imports}\right) \times 100 \qquad 4.14$$

where ToT is terms of trade. The volumes of both imports and exports play a crucial role in the macroeconomic activities of an economy.

Improvements in export increase productivity and improve the living standards of the nation. Imports one the one hand, improve the domestic economy, but on the other hand, send disposable income of the domestic residents outside, thus making the economy worse

off. Both imports and exports are very macroeconomic important indicators in the foreign exchange market, thus their ratio is used as a macroeconomic indicator in this case. Scholars such as Abimelech, Zhen, Presley and Isaac (2017), Alagided and Ibrahim (2017), Manalo, Perera and Rees (2015), Eita and Sichei (2006) and Su (2012) used it as a macroeconomic indicator. Terms of trade were expected to have a positive impact on the foreign exchange rate market. The data of exports and imports used to compute terms of trade was obtained from the Namibian Statistics Agency.

Government Expenditure

Government expenditure is defined as a case where the government spends money to purchase goods and services. The spending of the government mainly depends on the amount of revenue it generates, of which a large portion comes from the taxes they charge (Parkin, 2014). Generally, the overall output of an economy depends partially on the government input as well, from both investment and spending, thus it is very important as a macroeconomic indicator. On the other hand, most economies depend heavily on the government. The Namibian economy specifically, heavily depends on the government for the provision of most services; thus, it plays a crucial role in its macro-economy.

Government consumption includes goods and services produced domestically as well as those produced outside the economy. The government expenditure can therefore be used to reflect the macro-economy in the foreign exchange market. Scholars such as Alagided and Ibrahim (2017), Chatterjee and Mursagulov (2016) and Su (2012) used it in their studies as a macroeconomic activity indicator. Real government expenditure expressed in millions of Namibian dollars was used in this case and the data was collected from the

Namibian Statistics Agency. Government expenditure was expected to have a positive impact on the foreign exchange market.

4.5 Empirical Results

4.5.1. The Autoregressive Conditional Heteroscedasticity Results

The presence of volatility (ARCH effect) in the Namibian Foreign Exchange Market was tested using the ARCH modelling technique. The null hypothesis states that there is no volatility (ARCH effect) against the alternative hypothesis that there is a presence of volatility. The decision rule was made per the Langrage Multiplier (LM) test, where the probability value of the F-statistic and Observed R-squared was compared with the level of significance (Kilicarslan, 2018). If the probability value is less than the level of significance, the null hypothesis is rejected. However, if the probability value is greater than the level of significance then the null hypothesis cannot be rejected.

Table 4.1: ARCH Effect

Heteroskedasticity Test: ARCH			
F-statistic	4.59	Prob. F(6,82)	0.00**
Obs*R-squared	22.39	Prob. Chi-Square(6)	0.00**

*Source: Author's compilation using EViews. Notes: ** means the rejection of the null hypothesis at 5%*

Table 4.1 presents the results of the ARCH LM tests that indicates that the p-value of 0.00 was less than 0.05, the chosen level of significance. Therefore, the null hypothesis of no volatility was rejected, meaning the alternative hypothesis that stipulates the presence of

volatility, applied. This result suggested that the Namibian foreign exchange market was volatile. These findings were similar to that of Mokoma (2015) for South Africa, Omari *et al*., (2017) for Kenya and Abimelech *et al*., (2017) for Liberia.

The presence of volatility implied by the ARCH model was short term and the model did not provide any information on the persistence over the long-term horizon. Thus, estimating a GARCH Model allowed for the inclusion of both the information about volatility observed in the previous period (short-run volatility (ARCH term)) and forecasted variance from the previous period (long-run volatility (GARCH term). The results of the GARCH approach are presented in table 4.2 below.

Table 4.2: GARCH Model

Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob**
C	0.14	0.00	62.73	0.00
LNRER(-1)	0.10	0.00	5735.22	0.00
Variance Equation				
C	2.17	1.40	1.55	0.12
RESID(-1)^2	-0.11	0.05	-2.20	0.02
GARCH(-1)	1.03	0.03	37.86	0.00

Source: Author's compilation using EViews.

Table 4.2 presents the results of the GARCH model estimates, which show that the sum (1.14) of the coefficients of the ARCH (-0.11) and GARCH (1.03) is very close to one. It means that the volatility shocks had a persistent effect on the conditional variance. Thus,

the conditional variance did not converge on a constant unconditional variance in the long run. These findings were similar to that of Dlamini (2014) for Swaziland, Kandora and Hamdi (2016) for Sudan and Alagided and Ibrahim (2017) for Ghana.

The ARCH/GARCH Models revealed the presence and persistence of the volatility, but not the leverage effects (asymmetric effect) where negative shocks are pronounced to increase volatility compared to positive shocks. Thus, the TGARCH and EGARCH Models were estimated for that purpose, and the results are presented in tables 4.3 and 4.4 below.

Table 4.3: TGARCH Model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.14	0.00	44.78	0.00
LNRER(-1)	0.97	0.00	1934.98	0.00
Variance Equation				
C	2.05	1.53	1.34	0.18
RESID(-1)^2	-0.10	0.05	-1.86	0.06
RESID(-1)^2*(RESID(-1)<0)	-0.02	0.05	-0.33	0.74
GARCH(-1)	1.03	0.00	1360.41	0.00

Source: Author's compilation using EViews.

Table 4.3 shows that, in this case, the coefficient estimate of the threshold is different from zero, implying the asymmetry effect. In particular, the coefficient -0.02 was negative and statistically insignificant. Therefore, negative shocks had smaller effects on volatility than

positive shocks. That is positive news increase volatility in the Namibian Foreign Exchange Market. It follows that paying less Namibian dollars per US dollar, which implies a weakening of the US dollar (strengthening of the Namibian dollar), leads to lower volatilities in the next period than when the US dollar strengthens by the same amount.

This is in line with the theory that states that investors react less to positive news (strengthening of the Namibian dollar) in comparison to bad news (weakening of the Namibian dollar). However, this is partially in line with the IS-LM Model that states that in an open economy, such as Namibia, positive news in the exchange rate market attracts investors through an increase in interest rates (Blanchard, 2011).

Table 4.4: EGARCH Model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.15	0.14	1.09	0.28
LNRER(-1)	0.97	0.03	32.61	0.00
Variance Equation				
C(3)	-8.27	3.71	-2.23	0.03
C(4)	0.51	0.29	1.76	0.08
C(5)	-0.11	0.17	-0.62	0.54
C(6)	0.00	0.46	0.01	0.10

Source: Author's compilation using EViews.

Table 4.4 presents the results of the EGARCH that also revealed an asymmetric effect because the coefficient estimate, -0.11, was different from zero and negative, though statistically insignificant. This indicates that good news in the Namibian Foreign Exchange has larger effects than bad news. These results suggested that the positive shocks decreased volatility in the Namibian foreign exchange market, hence, the leverage effect. Thus, the results suggested that a weakening US dollar (strengthening Namibian dollar) led to lower next-period volatility than when the Namibian dollar weakens by the same amount. The results of the EGARCH confirmed that of the TGARCH of leverage effect as discussed above. That means that positive news and negative news do not result in the same reaction. After having tested for volatility in the foreign exchange market, the next step was to conduct the co-integration and ECM Models.

4.5.2 Error Correction Model

4.5.2.1 Error Correction Model: Volatility and Macroeconomic Indicators

Before estimating the error correction model, the variables were tested for a unit root to avoid the repeat of this step in the error correction model for foreign market exchange and macroeconomic activities. All the variables were tested for unit root at this juncture, using the PP and KPSS.

Table 4.5: Unit Root Test Results of the PP and KPSS Tests

Variable	**M.S**	**PP**		**KPSS**		**O.I**
		Levels	**1st diff.**	**Levels**	**1st diff.**	
LnRER	Intercept	-1.90	-5.15**	0.55	0.09*	1

	Intercept & Trend	-2.48	-5.10**	0.17	0.09*	1
LnIP	Intercept	0.79	-4.72**	1.29	0.17*	1
	Intercept & Trend	0.89	-4.76**	0.09*	0.14*	0
LnM2	Intercept	-1.44	-5.51**	1.30	0.10*	1
	Intercept & Trend	-1.58	-5.54**	0.14*	0.08*	0
LnI	Intercept	-1.66	-4.81**	1.18	0.23*	1
	Intercept & Trend	-0.96	-4.87**	0.10*	0.11*	0
LnTOT	Intercept	-1.46	-4.56**	1.10	0.11*	1
	Intercept & Trend	-1.81	-4.58**	0.15*	0.09*	0
LnGRNE	Intercept	-0.28	-4.89**	1.27	0.10*	1
	Intercept & Trend	-1.93	-4.86**	0.19	0.10*	1
Vol	Intercept	-2.51	-9.52**	1.02	0.13*	1
	Intercept & Trend	-3.18	-9.54**	0.06*	0.05*	0

*Source: Author's compilation using Eviews. Notes: ** means the rejection of the null hypothesis of non-stationarity at a 5% for the PP test, while *means no rejection of the null hypothesis of stationarity at a 5% for the KPSS test.*

Table 4.5 above presents the results of the unit root test. The results implied that all the macroeconomic activity variables, the real exchange rate together with the volatility variable, are mostly stationary in the first difference. A few variables were stationary in the level format a 5% level of confidence. A conclusion of stationarity was thus suggested, ranging between 0 and 1. After the unit root test, the next step was to test for cointegration amongst the variables based on the residual created from estimating a long-run equation.

The residual was tested for stationarity in levels, using both the PP and KPSS tests. The results are presented in Table 4.6 below.

Table 4.6: Residual-based co-integration I

Equation	**PP**	**KPSS**	**O.I**
Intercept	**-3.45****	**0.06***	**0**
Intercept & Trend	**-3.44**	**0.06***	**0**

*Source: Author's compilation using Eviews. Notes: ** means the rejection of the null hypothesis at 5% for the PP test, while *means no rejection of the null hypothesis of stationarity at 5% for the KPSS test.*

Table 4.6 shows that both the PP and the KPSS tests for stationarity revealed that the residual was indeed stationary in levels. Specifically, the calculated values under the PP test were greater than the critical values at a 5% level of confidence, respectively. Therefore, the null hypothesis of non-stationarity was rejected. The calculated values of the KPSS test were less than the critical values, and the null hypothesis of stationarity could not be rejected. These results suggested that an ECM was to be estimated.

The first ECM model estimated the relationship between volatility and macroeconomic indicators, whereas the second component estimated the relationship between the foreign exchange market and the macroeconomic activities in Namibia. The results of the ECM between volatility in the Namibian foreign exchange and the macroeconomic activities are presented in table 4.7 below.

Table 4.7: Error correction model (ECM) estimates for Volatility and Macroeconomic Indicators

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.10	1.50	0.41	0.69
D(LNIP)	-0.00	0.00	-1.74	0.09
D(LNM2)	-0.00	0.00	-0.52	0.60
D(LNINVST)	0.00	0.00	1.07	0.29
D(LNTOT)	0.00	0.00	0.37	0.71
D(LNGRNEXP)	0.00	0.00	2.04	0.04**
D(LAGGARCH01)	0.17	0.11	1.59	0.12
ECM(-1)	-0.37	0.09	-3.91	0.00**
R-squared	0.16	Mean dependent var		-5.95
Adjusted R-squared	0.10	S.D. dependent var		7.03
S.E. of regression	6.69	Akaike info criterion		-16.31
Sum squared resid	3.80	Schwarz criterion		-16.09
Log likelihood	766.21	Hannan-Quinn criter.		-16.22
F-statistic	2.38	Durbin-Watson stat		1.89
Prob(F-statistic)	0.03			

*Source: Author's compilation using Eviews. Notes: ** means significance at 5%*

The results in table 4.7 indicate that only government expenditure had a statistically significant positive impact on volatility in the Namibian foreign exchange market. Although that is the case, the results further suggest that industrial production and money supply had a negative insignificant impact on the volatility in the Namibian foreign exchange. These results are like the ones found by Kilicarslan (2018) as well as by Odili

(2015), where the macroeconomic activity variables also negatively impacted the volatility in the exchange rates.

Terms of trade and investments turned out to have a positive, insignificant impact on the Namibian foreign exchange market. This might be attributed to the fact that the big portion variation in volatilities in the foreign exchange market was explained by other factors that are not part of the model, such as the price of currencies traded, macroeconomic activities of economies that traded in the Namibian foreign exchange market, which are not captured in Namibia and other external factors.

Furthermore, the findings showed that about 16% of the variations in volatility in the foreign exchange market were explained by industrial production, money supply, investment, government expenditure and terms of trade, while the remaining 84% was explained by other variables not captured in this equation. The Durbin-Watson Test turned out to be 1.89, which is close to two, indicating that there was no presence of autocorrelation in the model or rather the acceptable level of autocorrelation. The error correction term was negative and statistically significant as desired. Thus, the speed of adjustment corrected the disequilibrium at about 37% every quarter in this model.

The ECM for volatility and macroeconomic indicators was also tested for serial correlation using the LM test and the results are presented in Table 4.8 below.

Table 4.8: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.00	Prob. F(6,56)	0.06
Obs*R-squared	18.73	Prob. Chi-Square(6)	0.10

*Source: Author's compilation using Eviews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

As explained in chapter three, the serial correlation test was conducted based on the null hypothesis that there was no serial correlation. The results in table 4.8 show that the probability value of the observed R-square was greater than 0.05. We failed to reject the null hypothesis and concluded that there was no serial correlation. The model was further tested for heteroscedasticity. The decision rule was as explained in chapter three, which was done by comparing the P-values of the F-statistic and that of the Chi-square to 5%. The results of the heteroscedasticity test are presented in table 4.9 below.

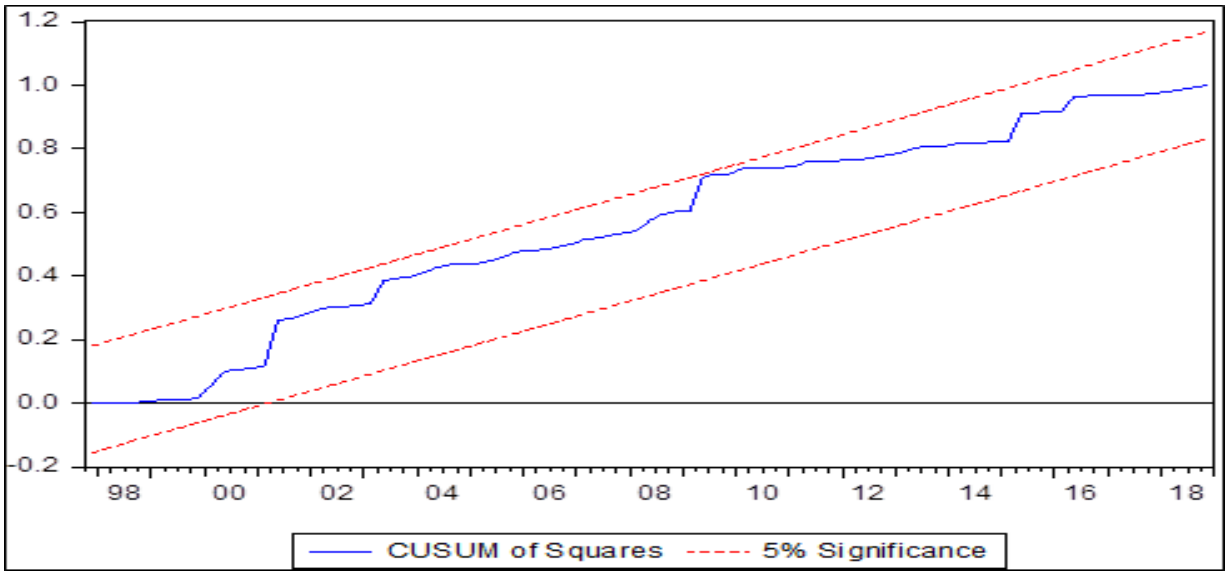
Table 4.9: Heteroscedasticity Test: White

F-statistic	7.86	Prob. F(14,62)	0.11
Obs*R-squared	49.25	Prob. Chi-Square(14)	0.11
Scaled explained SS	110.94	Prob. Chi-Square(14)	0.00

*Source: Author's compilation using Eviews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

The P-values of both the F-statistic and the Chi-square was greater than 0.05, meaning the null hypothesis of homoscedasticity could not be rejected. The Cumulative Sum of Squares (CUSUMQ) was also conducted to assess the stability of the model. If the plot lay within the bound of 5%, the model was assumed to be stable, as it was explained in chapter three. The results are presented in figure 4.1.

Figure 4.1: CUSUMQ Test Results



Source: Author's compilation using Eviews

The results of the CUSUMQ test in figure 4.1 above show that the plotlines with the 5% bound. The coefficients for the error correction model were stable, as expected.

4.5.2.2 Error Correction Model: Foreign Exchange Market and Macroeconomic Variables

After having tested for the relationship between the volatility and the macroeconomic variables, the next step was to test for the long- and short-run relationships between the Namibian Foreign Exchange Market and macroeconomic activity variables. A second residual was created, excluding volatility and it was tested for stationarity using the PP and the KPSS tests. If the residual was stationary in levels, co-integration was assumed, and the ECM could be conducted. The stationary results for the second residual are presented in table 4.10 below.

Table 4.10: Residual-based Co-integration II

	PP	KPSS	O.I
Intercept	**-4.20****	**0.08***	**0**
Intercept & Trend	**-4.18****	**0.08***	**0**

*Source: Author's compilation using EViews. Notes: ** means the rejection of the null hypothesis at 5% and 10% respectively*

The results in table 4.10 show that the residual was stationary in levels, for both the PP and the KPSS tests. The null hypothesis of no co-integration was thus rejected, and the alternative hypothesis of co-integration applied. Since cointegration was established, the error correction model was estimated to evaluate the long- and short-run relationships as well as the speed of adjustment to convergence to the equilibrium value.

The ECM was tested for stability at first, but it turned out to be unstable. Two variables, namely, terms of trade and investments were statistically insignificant at 5%, in explaining the foreign exchange market in the initial model. After their removal, the model was tested for serial correlation using the LM test and the results are presented in Table 4.11 below.

Table 4.11: Breusch-Godfrey Serial Correlation LM Test

F-statistic	6.07	Prob. F(6,82)	0.35
Obs*R-squared	28.91	Prob. Chi-Square(6)	0.26

*Source: Author's compilation using EViews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

The probability value of the observed R-square was greater than 0.05. We failed to reject the null hypothesis and concluded that there was no serial correlation. The model was further tested for heteroscedasticity. The results of the heteroscedasticity test are presented in Table 4.12 below.

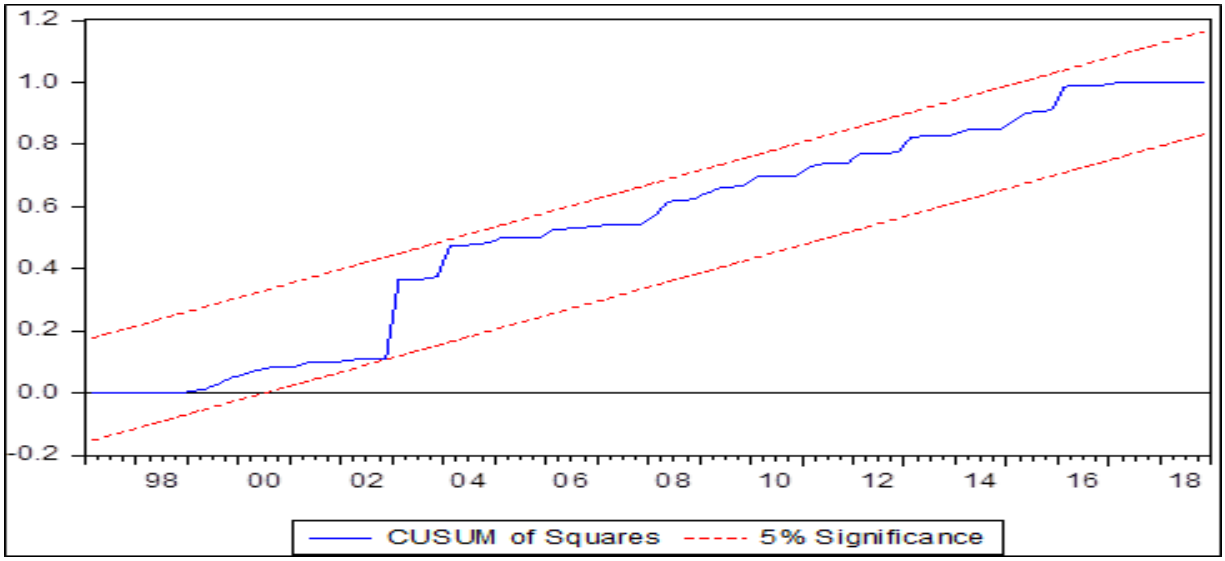
Table 4.12: Heteroscedasticity Test: White

F-statistic	0.64	Prob. F(14,62)	0.67
Obs*R-squared	3.30	Prob. Chi-Square(14)	0.65
Scaled explained SS	5.18	Prob. Chi-Square(14)	0.39

*Source: Author's compilation using EViews. ** means the rejection of the null hypothesis at a 5% level of confidence.*

The P-values of both the F-statistic and the Chi-square was greater than 0.05, thus the null hypothesis of homoscedasticity could not be rejected. After the heteroscedasticity test, the model was tested for stability using the Cumulative Sum of Squares (CUSUMQ) test. The results are presented in figures 4.2.

Figure 4.2: CUSUMQ Test Results



Source: Author's compilation using Eviews

The results of the CUSUMQ test in the figure above show that the plot lay with the 5% bound. The coefficients for the error correction model were stable. After the stability tests, the ECM results are presented in Table 4.13 below

Table 4.13: Error Correction Model estimates for Namibian Foreign Exchange Market and Macroeconomic Activity Variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.00	0.00	-1.88	0.06
D(LNIP)	0.42	0.18	2.26	0.03**
D(LNM2)	0.16	0.04	4.03	0.00**
D(LNGRNEXP)	-0.51	0.11	-4.50	0.00**
D(LAGLNRER)	0.52	0.07	7.21	0.00**
ECM(-1)	-0.16	0.03	-4.23	0.00**
R-squared	0.55	Mean dependent var		0.00
Adjusted R-squared	0.53	S.D. dependent var		0.02
S.E. of regression	0.01	Akaike info criterion		-5.74
Sum squared resid	0.02	Schwarz criterion		-5.58
Log-likelihood	276.11	Hannan-Quinn criter.		-5.68
F-statistic	21.84	Durbin-Watson stat		2.06

Prob(F-statistic)	0.00

*Source: Author's compilation using Eviews. Notes: ** means significance at 5%*

The results in table 4.13 reveal that all the macroeconomic activity variables were statistically significant and had an impact on the Namibian Foreign Exchange Market at a 5% level of confidence. Industrial production and money supply had a positive impact on the real exchange rate. A positive shock in industrial production and the money supply was going to bring about an improvement in real exchange rates of about 42% and 16%, respectively. An increase in industrial production was expected to have a positive impact on the exchange rate according to theory. An increase in industrial production, for example, was expected to bring about an increase in income. For an economy such as Namibia that depends heavily on imported goods and services, an increase in income will lead to an increase in imports. The increase in imports will in return bring about an appreciation of the Namibian dollar due to an increase in the interest rate, thereby increasing the exchange rate.

Money supply, however, was supposed to be negatively related to the exchange rates. This was because an increase in the money supply increased the prices of the financial assets, reducing the demand for domestic currency and in return pushed the exchange rate down. The positive effect of money supply on the foreign exchange rate was, however, not surprising. An increase in the money supply in the domestic economy was most likely to increase the demand for imports. This in turn increased the exchange rate, thus the positive reaction.

On the contrary, government expenditure in Namibia harmed the real exchange rate in Namibia, such that shocks in the government expenditure can bring about a reduction in

the real exchange rate. Specifically, the results showed that a 1% positive in government expenditure reduced the real exchange rates by 51%. For an economy that is dependent on imports of goods and services, such as Namibia, a negative relationship from government expenditure was expected.

All these results show the existence of the relationship between exchange rate and macroeconomic activity variables is similar to the findings by Kikuchi (2004), Su (2012) amongst others. In addition, the positive impact of macroeconomic activities towards the foreign exchange market, through the exchange rate, was like the results that were found by scholars such as Katusiime *et al*., (2016) and Odili (2015), just to mention a few.

In terms of econometric theory, the results show that the error correction term was statistically significant at a 5% level of confidence and its coefficient was negative as desired. This meant that, in case of disequilibrium, about 16% speed of adjustment was expected to bring about the convergence towards the long-run equilibrium. The multiple coefficients of determination (R-squared) showed that 55% of the fluctuations in the Namibian Foreign Exchange Market were explained by industrial production, money supply, as well as by government expenditure. This also meant that about 45% of the variation in the Namibian Foreign Exchange Market could be explained by other factors not captured in this model. Furthermore, the Durbin-Watson value was 2.06 that is close to 2, indicating the acceptance level of autocorrelation.

4.6 Summary

This chapter aimed at quantifying the relationship between the foreign exchange market and macroeconomic indicators in Namibia. Using quarterly data between 1995 and 2018,

three objectives were tested, using two different methodologies. The first specific objective was to test for the presence, persistence and asymmetry of volatility in the Namibian Foreign Exchange Market, using the ARCH, GARCH, TGARCH and EGARCH models respectively. The results revealed the presence of volatility in the Namibian Foreign Exchange Market. In addition, the results also revealed the persistence as well as the leverage effect in the Namibian Foreign Exchange Market.

With the presence of volatility in the Namibian Foreign Exchange Market, the ECM model was adopted to assess the relationship between volatility and macroeconomic indicators. The results suggested that there was a long- and short-run relationship between volatility and macroeconomic activities in Namibia. In particular, government expenditure was the only variable that explained the presence of volatility significantly. The model revealed a long relationship between the volatility in the exchange rate market and the macroeconomic activities in Namibia, with the model correcting the disequilibrium by about 37% every quarter.

Lastly, the study also tested the nature of the relationship between the foreign exchange market and macroeconomic indicators in Namibia. Investment and terms of trade were removed from the model to stabilize it. The results of the ECM model confirmed a long-run relationship amongst the variables, which was corrected at the speed of about 15% every quarter. All macroeconomic variables considered were significantly related to the Namibian Foreign Exchange Market. Industrial production along with money supply showed a positive short-run impact on the foreign exchange market; the government expenditure revealed a negative short-run influence on the foreign exchange market.

Chapter Five: The Relationship between the Namibian Housing Market and Macroeconomic Indicators

5.1. Introduction

This chapter analyses the relationship between the Namibian housing market and macroeconomic indicators. Firstly, a background on the relationship between the housing market and the macroeconomic indicators is given. Background and the knowledge gap in the Namibian housing market are presented in this part of the chapter. Secondly, literature related to the housing market and the macro-economy is reviewed and presented. The theoretical literature outlines the known relationship between the housing market and the macro-economy, while the empirical literature quantifies the relationship and presents the methodologies used.

The third subsection of this chapter discusses the methodology to be used in this chapter. The methodology presented was used to answer the main objective, together with the specific objectives of this chapter. After the methodology, the empirical results are presented. Lastly, a conclusion of the chapter is given.

5.2. The background of the Housing Market and Macroeconomic Indicators

Macroeconomic indicators in the economy serve as an important factor in determining the well-being of the economy. A lot of factors from all sectors of the economy influence the activities of the macro-economy, bringing about different outcomes. One of the major markets that are most likely to influence the macro-economy is the housing market. The housing market is the market where houses and properties are demanded and supplied at a given price level. The purchase of houses and properties by households is treated as a

consumption, while the same purchase by business individuals is treated as an investment, and thus it is important to consider when constructing macroeconomic policies (Chen, Chang, Yang & Hsieh 2012).

Chiripanhura (2018) stated that housing is one of the important socio-economic variables. The housing market influences the macro-economy through factors such as the money supply. Generally, an increase in money supply in the form of a credit to the economic agents will lead to an increase in the demand for houses and properties. This increase will shift the demand and supply curves in the housing market and bring about an increase in house/property prices and the opposite might also be true (Adam & Fuss, 2010).

In addition to the money supply, the housing market can also be reflected in the macroeconomic activities through interest rates (Dumicic, Casni & Sprajacek, 2012). The interest rate is known to be the opportunity cost of holding money (Parkin, 2014). An increase in house prices brings a reduction in the interest rates and the opposite is also true. Low-interest rates increase the availability of credit to households, which in turn increase consumption (Beltratti & Morana, 2010). Housing and properties are part of consumption; an extension of credit availability might increase the purchase of houses and properties, which in turn increases the overall household consumption and investment. All this will bring about changes in the macro-economy. The impact of the housing market on macroeconomic activities can also be seen through inflation (Cheng *et al*., 2012). A persistent increase in the price level reduces consumption through the wealth effect and in turn, reduces housing prices (Follain, 1982).

Furthermore, the housing market is generally known to have a positive impact on macroeconomic activities through disposable income (Savva, 2015). On the one hand, an

increase in disposable income leads to an increase in consumption, which might involve the consumption of houses and properties. This will bring about increases in the overall aggregate expenditure of an economy and in return change the macroeconomic activity.

On the other hand, an increase in disposable income at times brings about an increase in wealth if the consumers decide to save (Panagiotidis & Printzis, 2016). An increase in wealth increases collateral for the households, which in turn increases credit availability. In economies such as Namibia, where consumption is derived by borrowing, the increase in credit will, in turn, increase the purchase of properties by the community, either for personal use or as an investment, which in turn influences the macroeconomic activities on the economy.

Similarly, the relation between the housing market and macroeconomic activities can be seen through industrial production or real gross domestic product of an economy (Hepsen & Kalfa, 2009). Industrial production in general is supposed to reveal a positive relationship between the housing market and macroeconomic activities. This is supposed to be so because an increase in industrial production naturally brings about an increase in income, to both businesses and households. This increase in income increases the demand for houses and properties in the economy, for both personal use and investment. However, if the supply of houses does not increase with the demand for houses in the economy, this increase will lead to an increase in housing/property prices, other things being the same.

The average housing prices have been increasing as discussed and shown in chapter one. This increase in housing prices has been faced with fluctuating house volumes between 1995 and 2018. Furthermore, the Namibian economy has been faced with a shortage of houses, which is the result of the big gap between the supply and demand of houses.

Chiripanhura (2018) indicated that there is an affordability problem when it comes to houses in Namibia. Furthermore, the model put in place to allocate houses might have pushed the housing prices up, which saw households spending more than 28% of their incomes on housing (Chiripanhura, 2018).

In addition to this, the macroeconomic activity indicators in Namibia were fluctuating between 1995 and 2018. These are the indicators that are known by theory to relate the housing market to macroeconomic activities. For example, some of the major indicators such as money supply and gross disposable income have been increasing over time. This might be related to the increase in housing prices in Namibia.

Generally, the relationship between the housing market and the macroeconomic indicators of an economy can be reflected through the macroeconomic variables discussed above. Does the assumption of a relationship between the housing market and the macroeconomic activity through those variables hold? There might be a link between the increasing housing prices in Namibia and these macroeconomic indicators. This chapter aimed to quantify the relationship between the Namibian housing market and the macroeconomic indicators.

5.3 Literature Review on the Relationship between the Housing Market and Macroeconomic Indicators

This section of the chapter reviews literature linking the housing market to macroeconomic indicators. The first part discusses the theoretical literature. These are theories that relate the macro-economy to housing. The second part presents the empirical literature. These are studies done by different scholars, quantifying the relationship

between the housing market and macroeconomic indicators, using different methodologies.

Although the assumption of a relationship between the housing market and macroeconomic indicators are there, theories that hypothesize these assumptions directly are scarce, which is mainly because housing has been treated as part of consumption at most (Leung & Chen, 2017). Though this might be the case, theoretically, fluctuations in financial and macroeconomic variables will bring about fluctuations in the housing market through the housing prices. In turn, shocks in the asset prices (house prices) can be reflected through macroeconomic activities as well (Iacoviello, 2005).

One of such theories is the life cycle model. This theory states that households change their level of consumption throughout their lifetime. Household consumption includes the consumption of houses, which changes with economic variations. According to Browning and Crossley (2001), household consumption fluctuates with the business cycle. The assumption is that during an expansion phase of the business cycle, labour supply increases, increasing household consumption, which includes housing. Browning and Crossley (2001) further stated that households react to changes in the interest rate, although their reaction might be weak since the interest rate does not closely track the business cycle. Although the reaction might be weak, if households react to changes in the interest rates during the business cycle, rational consumers will change their consumption of houses accordingly, the housing being an asset.

A house makes up household wealth as well as private consumption (Dumicic *et al*., 2012). This means that changes in housing prices will bring about changes in private consumption, through the wealth effect. The housing market, through property prices, has

an impact on the financial system through the demand and the supply of credit. Credit availability depends on financial and non-financial variables, such as money supply interest rates, disposable income as well as inflation. Inflation is assumed to have a negative impact on the housing market (Follain, 1982).

Panagiotidis and Printzis (2016) stated that housing is considered a consumption good, or an investment. At most, housing is considered as wealth and it adds value to the assets of the economic agents. That being the case, housing is also directly connected to household income and therefore linked to consumption. This is mainly because houses/properties are used as collateral, which depends on the value of the house. This being the case, another theory that links the housing market to macroeconomic activities is the Q theory.

The Q theory was initially from the school of thought of Tobin (1969). This theory links the market price and the replacement costs of an asset to one another. The assumption here is that investors are attracted to assets that yield high returns and they make rational decisions. That being the case, when the market price of an asset is more than the replacement cost, it is profitable to invest. This theory further linked household investments to interest rates. Changes in interest rates are reflected through household investment and private consumption (Taylor 1995; Sheefeni & Ocran, 2016). In addition, Tobin (1969) stated that the money supply changes with private wealth. An increase in the money supply, for example, will bring about an increase in private wealth.

According to Gathuru (2012) and Berg and Berger (2006), the housing market depends on the consumer's decision, on buying and selling the houses. Other things being the same, the Q theory is based on the assumption that the decision by investors/consumers as well as the housing market equilibrium depends on the value of q. If consumers in the housing

market buy houses for speculative purposes, a value of q more than 1 will increase the purchase of houses, since it is profitable for the investor, and the opposite might be true (Kaulihowa & Kamati, 2019). These changes in the housing market might bring about changes in the investment level of an economy, in turn affecting the gross domestic product of an economy.

The housing market is very important when it comes to policy decisions, especially the monetary policy, as it can be subjected to the monetary policy transmissions through the credit channel (Sari, Ewing & Aydin, 2007). Dumicic, Casni and Sprajacek (2012) stated that interest rate has a negative impact on asset prices. At most, housing/properties are part of household assets and wealth. Shocks in the housing prices can be reflected in interest rates and the other way round. It is from this point that Dumicic *et al*., (2012) assumed that shocks in interest rates might lead to an overreaction in the housing prices, especially when there is a reduction in interest rates. This overreaction in interest rates might lead to house bubbles if interest rates fall too low (Joebges, Dullien & Marquez-Velazquez, 2015).

In addition to changes in the interest rate, money supply plays an important role in the housing market because it reflects how the housing market responds to monetary policies. Since housing is considered an investment, the impact of money supply on the housing market can also be reflected through interest rates (Bernanke & Gertler, 1995). On the one hand, an increase in money supply by the central bank increases credit availability to the economic agents through the depository institutions. This increase in credit availability increases consumption, through loans. In the process, consumption for houses/properties might also increase. On the other hand, a reduction in interest rates might increase the

money supply in the process. If, for example, the Bank of Namibia reduces the repo rate, the credit will increase, and consumption might increase through borrowing.

Adam and Fuss (2010) stated that the housing market does not respond immediately to changes in economic news. This is simply because households buy properties as wealth, and they are most likely to have their reservation prices. They buy the properties for speculative motives, and they will only be willing to sell when the price is high enough (Case & Shiller, 1989). They might wait until their reservation price is met before they sell. Adam and Fuss (2010), further stated that fluctuations in the macroeconomic activities through variables such as money supply, interest rate and industrial production, will have a lag impact on the housing market. This lag effect will depend on how fast households adjust their consumption and their allocation of funds to the changes in those variables.

Adam and Fuss (2010) mentioned that there might be a feedback reaction between the housing market and the macroeconomic indicators through the wealth effect. This is most likely to occur when the value of houses/properties goes up. This increase in the value of houses is likely to increase the collateral that the household has, and this will in turn increase borrowing. This whole operation will end up increasing consumption, thus shifting the macroeconomic activities of an economy. This idea of house prices increasing credit supply was supported by Parker (2010), where the scholar stated that mortgage plays a huge role in both the housing market and macroeconomic activities. His/she assumed that housing prices have a stronger impact on macroeconomic activities through consumption. If that is the case, a reduction in housing prices is most likely to bring about

mortgage defaults, which reduces the supply of credit to households, reducing the overall consumption at the end.

Theories discussed above hypothesize that there is a link between the housing market and macroeconomic indicators. Changes in the level of interest rates can be reflected through investments, inflation and money supply. Changes in these macroeconomic variables can be reflected in the housing market since housing is considered part of private consumption. Changes in financial variables such as money supply can lead to changes in disposable income, which in the end can be reflected through consumption. These shocks can furthermore be reflected through the gross domestic product of the economy. Can this be assumed for the Namibian economy? The objective of the study was to test these theories on the Namibian economy.

Apart from theories, some scholars conducted studies on the housing market, using different methodologies to quantify the relation between the two. Scholars, Sari, Ewing and Aydin (2007) did a study in Turkey, analyzing the relationship between macroeconomic variables and the housing market between 1961 and 2000. These scholars used the Vector Autoregressive Model in their methodology. The results indicated that macroeconomic activities had an impact on the housing market in Turkey. Moreover, their findings indicated that some variables, such as money supply and interest rates, play a huge role in comparison to other macroeconomic variables when it comes to shocks in the housing market. Furthermore, a feedback relation was discovered in this study, where shocks in macroeconomic activities affected the housing market, and at the same time, the housing market shocks also influenced the macroeconomic activity fluctuations.

Beltratti and Morana (2010) also conducted a study focusing on the international house prices and macroeconomic fluctuations in the G-7 countries, using quarterly data between 1980 and 2007. In their analysis, they applied the Factor Vector Autoregressive Model (F-VAR), under which they applied tests such as the ADF and the KPSS tests for stationarity, as well as the impulse response together with the forecast error variance decomposition to assess the relationship between the housing market and macroeconomic activities. They discovered that other things being the same, there was a relationship between the housing market and the macroeconomic activities, a relationship that was reflected through investments.

Similarly, scholars such as Hepsen and Kalfa (2009) analyzed the housing market activity and macroeconomic variables in Turkey in the Impulse response as well as the variance decomposition tests in their methodology between 2002 and 2007. Their study showed a feedback relationship between the housing market and the macroeconomic activities as well. Shocks in macroeconomic activities brought about changes in the housing market, while shocks in the housing market also had a major influence on the overall performance of the economy.

Adam and Fuss (2010) did a study on the 15 OECD countries, testing the macroeconomic determinants of the international housing market, applying the Panel Co-integration Test on quarterly data between 1975 and 2007. The results showed that there was a direct relationship between the housing market and macroeconomic activities. To be specific, variables such as industrial production and money supply increased the demand for houses and properties, increasing the housing prices in the process as well. The interest rate was also regarded to be one of the major variables influencing the housing market in this study,

positively influencing the housing market in the short run, reducing the housing prices in the long run. Musso, Neri and Stracca (2011) conducted a study on housing consumption and monetary policy using data from the US and the Euro Area. These scholars adopted the structural Vector Auto Regression Model (SVAR) in their methodology and concluded that there was a relationship between the housing market and macroeconomic activities. To be specific, the influence was seen from the housing market towards macroeconomic activities through consumption and investments. This might be due to the wealth effect.

Ncube and Ndou (2011) conducted a study on monetary policy transmission, house prices and consumer spending in South Africa using the Structural Vector Autoregressive Model (SVAR) on quarterly data between 1975 and 2009. All other things being the same, the study indicated that the housing market reacted to changes in macroeconomic activities through interest rates and consumption. By the same token, Chen, Chang, Yang and Hsieh (2012) conducted a study on the Taiwan economy, examining the relationship between investment demand and housing prices. They applied a Threshold Autoregressive (TAR) test in their methodology, using quarterly data between 1975 and 2009. The results revealed non-linear fluctuations in the housing market, as the macroeconomic activities changed. Despite the non-linear movement, the money supply was the one variable that played a role in the movement in the housing market, with inflation and investment demand also contributing their fair shares.

Dumicic, Casni and Sprajacek (2012) conducted a study on estate prices and the macro-economy in Croatia, using quarterly data between 2002 and 2011. These scholars adopted the VAR approach, specifically the Structural Vector Autoregressive Model (SVAR) in their methodology together with the impulse response and the forecast variance

decomposition. All other things being the same, the authors discovered a relation between the housing market and the macroeconomic variables, running from real estate development toward the domestic macroeconomic variables. Furthermore, the study revealed that foreign macroeconomic activities also had an impact on the housing market of Croatia, which might have been due to foreign agents who owned houses and properties in the Croatian economy.

Fraser, Hoesli and McAlevey (2012) did a study on house prices, disposable income and shocks in New Zealand between 1973 and 2008. These authors adopted the Vector Autoregressive Model (VAR) as well as the Structural Vector Autoregressive Model (SVAR), out of which they conducted the impulse response. Their results indicated that the housing market was sensitive to shocks in macroeconomic activities. Also, a long-run stable relationship between the housing market and the macroeconomic activities was concluded.

Nneji, Brooks and Ward (2013) did a study on house price dynamics and their reaction to macroeconomic changes using quarterly data between 1960 and 2011. The scholars applied the Markov Switch Three-stage Model and found a relationship between the housing market and macroeconomic activities. This relation was reflected through the interest rate, which revealed a negative impact on housing prices. Furthermore, inflation turned out to be significant in driving and influencing housing prices, while disposable income had a huge positive impact on the housing market in comparison to other macroeconomic activity variables. Likewise, Cesa-Bianchi (2013) looked at housing cycles and macroeconomic fluctuations on a global perspective, using 33 major advanced and emerging economies, which accounted for about 90% of the world gross domestic

product. The study indicated that shocks in the demand for housing were transmitted to the domestic economies fast through the gross domestic product.

Tsai (2013) did a study on the asymmetric impact of monetary policy on housing prices in the United Kingdom, using quarterly data between 1986 and 2011. This scholar adopted models such as the GARCH and the VECM in his/her methodology and found a relationship between the housing market and the macroeconomic activities through the housing prices. Correspondingly, Panagiotidis and Printzis (2016) conducted a study looking at the macroeconomic determinants of the housing market in Greece. These scholars used the two-stage Vector Error Correction Model (VECM) in their methodology on monthly data between 1997 and 2013. The results of the study indicated that there was an equilibrium between the housing market and the macroeconomic activity variables. Specifically, the findings indicated that there was a causal relationship between the housing market and the macroeconomic activities, seen through mortgage retail, inflation as well as retail trading. Though this might be the case, the output further indicated that some of the macroeconomic activity variables, specifically industrial production, did not have any significant impact on the housing prices in Greece.

Likewise, Savva (2015) did a study on housing price dynamics and its reaction to macroeconomic changes in Cyprus, using quarterly data between 2001 and 2014. For analytical purposes, the author used the Markov Switching Model (MS) to assess the relationship between the housing market and macroeconomic activities. The study concluded that the housing market depended on the macroeconomic activity fluctuations in the Cyprus economy, seeing a positive impact during the boom period, whilst negative effects were expected when the economy undergoes recession. Also, Loo, Anuar and

Ramakrishnan (2015) did a study on the Asian real estate investment trust and macroeconomic variables. The scholars used the cointegration test and the Granger Causality Test and found a long-run relationship between the REIT and macroeconomic variables. Furthermore, the REIT turned out to be more sensitive to changes in the macroeconomic variables in comparison to its development.

Skuka, Remeikiene and Gaspareniene (2016) assessed the impact of macroeconomic factors on housing price levels in Lithuania between 2008 and 2015 using a correlation linear regression analysis methodology. Their study indicated that the housing market depended on macroeconomic activities through housing prices. The amount of gross domestic product and inflation indicated a positive impact on the housing prices, while inflation revealed a negative relation towards the housing market.

Rahal (2016) investigated the housing market and monetary policy in OECD countries. Adopting the VAR methodology, the results suggested that the housing market was affected by the monetary policy, across countries. Antonakakis and Floros (2016) also did a study in the UK. They used data between 1997 and 2015 and adopted the VAR approach. They found that there were spillovers from the housing market towards the macroeconomic activities. These spillovers were reflected through inflation, economic growth and monetary policy.

Kotseva and Yanchev (2017) analyzed the housing market and the macroeconomic fundamentals in Bulgaria using the Vector Error Correction Model (VECM) using quarterly data between 2000 and 2014. They also found a relationship between the housing market and macroeconomic activities. To be specific, they discovered that a decrease in housing prices would increase incomes whilst reducing interest rate. While that might be

the case, their results also revealed that fluctuations in the housing market were caused by macroeconomic variables. Besides, Zhu, Betzinger and Sebastian (2017) did a study on 11 European countries, looking at housing market stability, mortgage market structures and monetary policies. Using the panel Vector Autoregressive Models, the study concluded that financial instabilities in the financial sector macroeconomic, as well as the instabilities in the macroeconomic activities, led to fluctuations in the housing market.

Coskun and Jadevicius (2017) conducted a study on the housing bubble in Turkey. They adopted the multi-strand approach, together with the CASE and SHILLER models on data between 2010 and 2014. They found that there was no housing bubble in Turkey, irrespective of an increase in the price of housing. Al-Masum and Lee (2018) conducted a study in Sydney. They adopted the Johansen Co-integration Test and the VECM approach and found gross disposable income and gross domestic product to be the long-term key determinants of house prices.

All these scholars quantified the relationship between the housing market and the macroeconomic indicators from those respective economies. At most, empirics showed that the relationship is transmitted through the house price and various macroeconomic variables. Can the same be assumed for the Namibian economy? Few studies touched on the Namibian housing market and macroeconomics. One such study was conducted by Kaulihowa and Kamati (2019) in which they analyzed the determinants of volatility in house prices in Namibia. These scholars applied three models in their work, namely, the Vector Autoregressive Model (VECM), the Autoregressive Conditional Heteroscedasticity (ARCH) and the General Autoregressive Conditional Heteroscedasticity (GARCH) models. Using quarterly data between 2007 and 2017, they

found a presence of volatility in the Namibian house prices as well as a unidirectional causality, running through gross domestic product and the house prices. This revealed that other things being the same, the macroeconomic activities influenced the housing market through GDP, and the housing market also influenced the macroeconomic activities through GDP.

Sunde and Muzindutsi (2017) carried out a study, looking at the determinants of house prices in Namibia, considering some macroeconomic activities indicators such as output, inflation and interest rates. The authors adopted a VECM model and found a relationship between the housing market and the macroeconomic activities through house price, inflation and output in Namibia. Other scholars such as Mwilima, Fillipus and Freermuys (2011) simply did studies evaluating the performance of the programs put in place, programs developed specifically to improve the housing market in the Namibian economy.

In addition to all these studies, a few more that might be relevant to the housing market in Namibia were focused on the monetary policy transmission in the Namibian economy. One study was conducted by Sheefeni (2017), where the author used quarterly data between 2000 and 2016. This study looked at the housing market and the macroeconomic variables through the monetary policy transmission mechanism in Namibia. Using the Bayesian VAR, the scholar found that the relationship between the housing market and macroeconomic activities was mainly explained by house prices, real gross domestic product and inflation. One the one hand the real gross domestic product responded negatively to shocks in the housing market, whilst inflation responded positively. On the

other hand, the housing market was negatively affected by the real gross domestic product, while positively related to inflation in Namibia.

All these scholars found a link between the housing market and macroeconomic indicators through different variables, using different models in their analyses. This chapter adopted the Structural Vector Autoregressive Model (SVAR) to assess the dynamic interaction between the housing market and macroeconomic activities in Namibia, considering variables such as money supply, interest rates, real gross domestic product, inflation and disposable income to represent the macroeconomic activities. The specific objectives of this chapter were to determine the long-run relationship between the Namibian housing market using the Johansen Co-integration Approach as well as to determine the causal relationship using the Granger Causality.

5.4 Methodology

5.4.1. Model Specification

To determine the relationship between the housing market and macroeconomic indicators in Namibia, a simple model almost similar to the one used by Nneji *et al*., (2013), Savva (2015) and Sunde and Muzindutsi (2017) was adopted and is presented as:

$$HP = f(M2, IR, RGDP, INFL, GNDI) \quad 5.1$$

where HP is the house prices, M2 is money supply, IR is real interest rates, RGDP is a real gross domestic product, INFL is inflation and GNDI is gross national disposable income. When turned into logarithms, equation 5.2 can be represented as:

$$\ln HP = \beta_0 + \beta_1 \ln M2 + \beta_2 \ln IR + \beta_3 \ln RGDP + \beta_4 \ln INF + \beta_5 \ln GNDI + U_t \quad 5.2$$

where β_0 is a constant, β_1, β_2, β_3, β_4 and β_5 are coefficients, U_t is the error term, while all other variables are the same as defined in equation 5.1.

Before the Structural Vector Autoregression was adopted, the data had to be tested for stationarity. The PP and the KPSS tests for stationarity were adopted in this chapter, similar to chapters three and four. After the data had been tested for stationarity, the co-integration test was also conducted. This test tested for the long-run relationship in the variables. In this case, this study adopted the Johansen and Juselius (1990) co-integration test that was based on two statistical tests: the Trace Statistics and the maximum Eigen Value Statistic Inferences. The Trace Statistic conclusions were based on the following equation:

$$\varphi_{trace} = -\theta \sum_{i=r+1}^{n} ln(1 - \varphi_i) \qquad 5.3$$

where θ is the number of observations, φ_i is the ith Eigenvalue, while r is 1,2, 3,…, n-1. The maximum Eigenvalue test was based on the following model:

$$\varphi_{max} = -\theta\ ln(1 - \varphi_{r+1}) \qquad 5.4$$

where r = 0,1, 2,…,n-2, n-1. Inferences regarding co-integration from these two tests were done by comparing the calculated value with the critical value. After the co-integration, the Structural Vector Autoregression was conducted. These two tests tested for the null hypothesis of no co-integration with the alternative allowing for the presence of co-integration. The decision rule was made by comparing the Trace Test Statistics and the maximum Eigenvalue with the statistical value in the table. If the Trace Statistic or the maximum Eigenvalue was more than the statistical value, the null hypothesis could not be accepted

The Structural Vector Regression (SVAR) was proposed by Sims (1980) whose idea was to capture the structural innovations from the residuals (Enders, 2004). The SVAR thus far was adopted by scholars such as Blanchard and Quah (1989) amongst others, imposing restrictions to obtain the structural changes. According to Fernandez-Villaverde and Rubio-Ramirez (2004), the SVAR Model was a multivariate linear representation of observation vectors, with their lags. Furthermore, the SVAR was done based on the assumption that restrictions were imposed on the model, to observe and to isolate the estimates from the independent variable. Although the SVAR was mostly used in studies concerning policy implications, McCoy (1997) stated that the SVAR Model could be regarded as a bridge between the theory of economics and other observations. This model was also helpful in identifying the response of variables to changes in economic activities.

The SVAR is part of the Vector Autoregressive (VAR) models, known as the reduced VAR. The difference between the VAR and the SVAR is that the VAR treats all the variables endogenous and does not identify any restrictions. Furthermore, variables are assumed to have similar sets of regressors (McCoy, 1997). Unlike the VAR, the SVAR does not treat all the variables proportionally. The SVAR uses economic theory to make restrictions that then identify the set of disturbances independently (McCoy, 1997). The SVAR restrictions can be imposed to find short-run disturbances as well as long-run effects. This chapter adopted an SVAR Model by Enders (2004) that is similar to the one used by Ncube and Ndou (2011), Dumicic *et al*., (2012) and Dlamini (2014). A simple VAR Model in matrix form was assumed to take the following form:

$$ZX_t = \sum_{i=1}^{p} Y_t X_{t-i} + e_t \qquad 5.5$$

where Z is the square matrix of coefficients to be estimated; X represents the vector containing the five endogenous variables; e represents the vector of uncorrelated mutual orthogonal structural disturbances and finally, p is the number of lags selected. Equation 5.5 can be turned into a reduced form if multiplied by Z^{-1} to get an observable model represented by equation 5.6 below.

$$X_t = Z^{-1} \sum_{i=1}^{p} Y_t X_{t-i} + \in_t \qquad 5.6$$

where all the variables are as defined in equation 5.3 and $\in_t$ is the vector of errors in the reduced model. The error term of the reduced VAR Model was assumed to be serial uncorrelated, but not necessarily orthogonal (Dlamini, 2014). To identify the identified system, restrictions needed to be imposed (Dumicic *et al*., 2012). The diagonals were assumed to be normalized to 1 according to Ncube and Ndou (2011), so $k \times (k-1)/2$ restrictions on the simultaneous coefficient matrix of the structural model. If the variables were ordered in the following order: money supply, interest rates, real GDP, inflation and gross national disposable income, the SVAR Matric Model can be expressed as follows:

$$\begin{bmatrix} \in^{HP} \\ \in^{M2} \\ \in^{IR} \\ \in^{RGDP} \\ \in^{INFL} \\ \in^{GNDI} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix} \times \begin{bmatrix} e^{HP} \\ e^{M2} \\ e^{IR} \\ e^{RGDP} \\ e^{INFL} \\ e^{GNDI} \end{bmatrix} \qquad 5.7$$

where $e^{HP}\ to\ e^{GNDI}$ are the structural disturbances, while $\in^{HP}\ to\ \in^{GNDI}$ are the residuals from the reduced form equations.

The Structural Vector Autoregression was primarily conducted to obtain the Granger Causality, the impulse response and the forecast error variance decomposition. The

Granger Causality Test explained whether the variables predicted one another. According to Brooks (2008), the impulse response showed the sensitivity of the variables, mostly the independent variables from the shocks in other variables in the model. Furthermore, it also showed the time lag of the effects on the variables when there were shocks in the model. The variance decomposition on the other hand showed the innovations in the variables, determining whether they were from their shocks or shocks in other variables when compared to one another (Brooks, 2008).

5.4.2. Data and Data Sources

To assess the relationship between the housing market and macroeconomic indicators, it is important to note that this chapter also made use of quarterly secondary data from 1995 to 2018. This data was collected from the Bank of Namibia, the Namibian Statistics Agency as well as the Namibian First National Bank. The study made use of six variables in total. The independent variable was the average house prices. This variable was used as a proxy for the housing market in Namibia. The other five variables were the dependent variables and they were used to represent the macroeconomic activities in the Namibian economy. They were money supply, real interest rates, real gross domestic product, inflation and gross domestic product.

5.3.3 Justification and Measurement of the Variables

The study made use of some macroeconomic variables similar to those used in chapters three and four. These variables were used as macroeconomic indicators by many scholars and to reflect the asset markets on the macro-economy. Similar to other asset markets, the housing market depends on macroeconomic variables such as money supply, real interest

rate, real gross domestic product and inflation. The money supply, inflation and interest rates are used to represent the monetary aspect of the macro-economy and they play a huge role in the consumption and allocation of houses. The gross domestic product and gross national disposable income measure the living standards of the nation (Parkin, 2014). An increase in GDP and GNDI increases consumption in the economy, other things being the same, and it might also affect the housing market. That is why they were also used in this chapter. They are justified below.

House Prices

House prices determine the demand and supply in the housing market, and it is one of the main factors in the housing market. The average national house price in the Namibian dollar is used in this chapter. The use of house price as a proxy of the housing market is informed by theory and empirical literature. The impact on the supply and the demand for housing from the macroeconomy is reflected through the house prices. That being the case, most of the scholars such as Nneji, Brooks and Ward (2013), Beltratti and Morana (2010), Chen, Chang, Yang and Hsieh (2012) as well as Adam and Fuss (2010) used it in their studies as a proxy for the housing market.

Money Supply

As defined earlier, the money supply is the amount of currency outside the depository institutions, excluding the deposits (Bank of Namibia, 2017). The amount of money injected into the economy affects consumption. According to theory and literature, money supply reflects the amount of household credit and consumption. An increase in the money supply might increase the consumption of housing or increase investments. It is against

this background that the money supply is used as one of the macroeconomic indicators of the housing market. It was also used by Chen *et al*., (2012) and by Adam and Fuss (2010) as a macroeconomic indicator in their studies on the housing market. Real money supply in Namibian dollars was used in this chapter.

Real Interest Rates

The real interest rate is the nominal interest rate adjusted for inflation (Parkin, 2014). The real interest rate is used as one of the monetary policy instruments that are aimed at achieving macroeconomic objectives. It plays a crucial role in the financial market through other interest rates. For instance, in Namibia, the central bank controls the quantity of money through the repo rate that is the rate at which it lends money to the depository institutions (Bank of Namibia, 2017). The change in the real interest rate thus has an impact on the quantity of money in an economy, thereby influencing consumption. On the other hand, the interest rate is defined as the cost of holding money. An increase in interest rate reduces borrowing, which in turn decreases consumption that includes housing. The real interest rate is thus an import macroeconomic indicator. It was used by Nneji, Brooks and Ward (2013), Beltratti and Morana (2010) and others in their studies on the housing market. The real interest rate in percentages is used in this chapter.

Real Gross Domestic Product

Parkin (2014) defined gross domestic product (GDP) as the total production of final goods and services produced in an economy at a given point in time, measured at its market value. There are two types of GDP, the nominal GDP and the real GDP. The real GDP is the production measure at the price level of a base year. Assuming that the price level does

not change, real GDP gives the change in production over the years. Real GDP is one of the indicators of macroeconomic activities because it can give a reflection of the level of employment, amongst others, which reflects housing through consumption. Real GDP in Namibian dollars is used in this chapter. It was used in studies on the housing market by scholars such as Beltratti and Morana (2010) and Panagiotidis and Printzis (2016) amongst others.

Inflation

Another important macroeconomic indicator is inflation. Inflation is defined as the persistent increment in the price level over time (Parkin, 2014). Inflation reflects the living standards of the nation through its purchasing power. The higher the inflation rate, the worse off the society is, and the opposite is true. This process has an impact on the level of real GDP as well as on the level of employment in an economy. Panagiotidis and Printzis (2016), Hepsen and Kalfa (2009) among others, used it as one of the macroeconomic indicators in their studies on the housing market. It is used in percentages in this chapter as well.

Gross Domestic Disposable Income

Gross domestic disposable income is the amount of money left at the disposal of the households, mostly presented after deductions (Parkin, 2014). Bank of Namibia (2017) defines gross domestic income as the amount of income the residents hold, plus the net income transfers from abroad. Generally, disposable income is reflected through aggregate consumption, which is the total sum of all the goods and services consumed by the households in an economy. It is for this reason that the gross disposable income is used

as a macroeconomic indicator. It was used by Katusiime, Agbola and Shamsuddin (2016), Mohsen and Ferda (2017), Chen, Chang, Yang and Hsieh (2012) and others in their studies. It is used in Namibian dollars as well.

Table 5.1 below indicates the variables, their expected outcome as well as their measurements.

Table 5.1: Variables and their Measurements

Variables	**Descriptions**	**A prior Expectation**	**Sources**
Dependent Variable			
House Price Indices	The average of house prices in Namibia expressed in N$	N/A	FNB
Independent Variables			
Money Supply	The total quantity of broad money, expressed in N$	POSITIVE	BON
Real Interest Rate	The rate of interest adjusted for inflation, expressed in %	NEGATIVE	BON
Real Gross Domestic Product	The total amount of gross domestic product, expressed in N$	POSITIVE	NSA
Inflation	National consumer price index, expressed in %	NEGATIVE	BON
Gross National Domestic Income	National total income, expressed in N$	POSITIVE	BON

Source: Author's computation

5.5 Empirical Results

5.5.1 Unit Root Test

The study made use of time-series data that is most likely known to be bogus. Granger (1969) informed literature that the unit root tests are necessary to ensure that the

regressions make sense. To ensure that the data gives reliable output, it is necessary to test the data for stationarity, as it was done in chapters three and four. Furthermore, the unit root test reveals the order of integration. The results of the PP and KPSS tests are presented in table 5.2 below.

Table 5.2: Unit Root Results of the PP and KPSS Tests

Variable	**M.S**	**PP**		**KPSS**		**O.I**
		Levels	**1st diff.**	**Levels**	**1st diff.**	
LnHP	Intercept	-0.17	-3.07**	1.28	0.22*	1
	Intercept & Trend	-2.50	-2.77	0.18	0.22*	1
LnRGDP	Intercept	0.79	-4.72**	1.29	0.17*	1
	Intercept & Trend	0.89	-4.76**	0.09*	0.14*	0
LnM2	Intercept	-1.44	-5.51**	1.30	0.10*	1
	Intercept & Trend	-1.58	-5.54**	0.14*	0.08*	0
LnINFL	Intercept	-2.47	-5.01**	0.45*	0.04*	0
	Intercept & Trend	-2.79	-4.97**	0.06*	0.04*	0
LnRIR	Intercept	-6.22**	-6.85**	0.72	0.23*	1
	Intercept & Trend	-6.02**	-6.22**	0.03*	0.04*	0
LnGNDI	Intercept	-1.90	-5.15**	0.55	0.09*	1
	Intercept & Trend	-2.48	-5.10**	0.17	0.09*	1

*Source: Author's compilation using EViews. Notes: ** means the rejection of the null hypothesis of non-stationarity at 5% for the PP test, while *means no rejection of the null hypothesis of stationarity at 5% for the KPSS test.*

As mentioned in chapter three, the decision rule was made by comparing the calculated value with the critical value at a 5% level of confidence in this case. To reject the null hypothesis, the calculated value has to be more than the critical value and concluded non-stationarity. The results in table 5.2 show that all the variables were stationary in the first difference under the PP test, except for the house price that only became stationary after the second difference. The KPSS test suggested that all variables were stationary in the first difference. Some of the variables such as real interest rate, inflation, money supply and the real gross domestic product turned out to be stationary in levels. A mixture of 0 to 1 order of integration was thus concluded. After having established stationarity and the order of integration, the next step was to test for co-integration.

5.5.2 Co-integration Test

The cointegration test was conducted to determine whether the variables in the model unite toward the equilibrium in the long run, in other words, to test for the long-run relationship between the variables. Since the unit root indicated a mixture of order 0 and 1, the Bound test of cointegration, similar to the one done under chapter 3, is conducted instead. The results are presented in Table 5.3 below.

Table 5.3: The Bound Co-integration Test Results

Test Statistic	Value	Significance	I(0) Bound	I(1) Bound
F-Statistic	3.82	10%	2.08	3.00
K	5	5%	2.39	3.38**

*Source: Author's compilation using EViews. Notes: ** means the rejection of the null hypothesis at 5%*

The null hypothesis of the Bound test is that there is no cointegration. The decision rule is made by comparing the F-statistic with the upper bound critical value. If the upper bound critical value is less than the F-statistic, than the null hypothesis of no cointegration has to be rejected. The results in Table 5.3 indicated that the F-statistic value is greater than the upper bound critical value at 5%. The null hypothesis of no cointegration was rejected. There is a long-run relationship between the housing market and macroeconomic indicators. After having established the co-integration, the next step was to conduct the Structural Vector Autoregression Model.

5.5.3 Structural Vector Autoregression

The Structural Vector Autoregression Model is the same as a simple vector autoregressive model. That being the case, the Model had to go through all the necessary VAR fitness tests such as the lag selection criteria and the stability polynomial condition. The lag length selection is presented in table 5.4 below.

Table 5.4: The VAR Lag Order Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
0	NA	1.29	-3.45	-3.24	-3.37
1	1257.74	1.49	-24.02	-22.62	-23.47
2	124.52	4.24	-25.31	-22.70**	-24.28
3	23.22	8.34	-24.71	-20.89	-23.20
4	18.64	1.83	-24.06	-19.05	-22.09
5	158.41	6.77	-27.62	-21.39	-25.16
6	65.97**	2.96**	-28.86**	-21.44	-25.93**
7	20.13	7.10	-28.67	-20.04	-25.27

*Source: Author's compilation using EViews Notes: (a)** indicates the lag order selected by the criterion. (b) LR is the sequentially modified LR test statistic; FPE is the final*

prediction error, AIC is the Akaike information criterion, SIC is the Schwarz information criterion while HQ represents the Hannan-Quinn information criterion.

The lag length test was done to indicate the number of lags that are ideal for the model as well as the point of convergence. The selection was done using five tests as indicated in table 5.4 above. The LR, FPE, AIC and HQ tests showed a lag order of six, while the SIC showed a lag order of two. Theory enlightens us that the SIC and AIC tests are used, especially the SIC, because of its consistency. Moreover, the theory suggests that, in the case of quarterly data, the HQ test be considered. In this case, however, the lag order of six that was selected by the majority of the tests was used to ensure accuracy. The model was further tested for stability and the results are presented in Table 5.5.

Table 5.5: The Stability Condition for the VAR Model

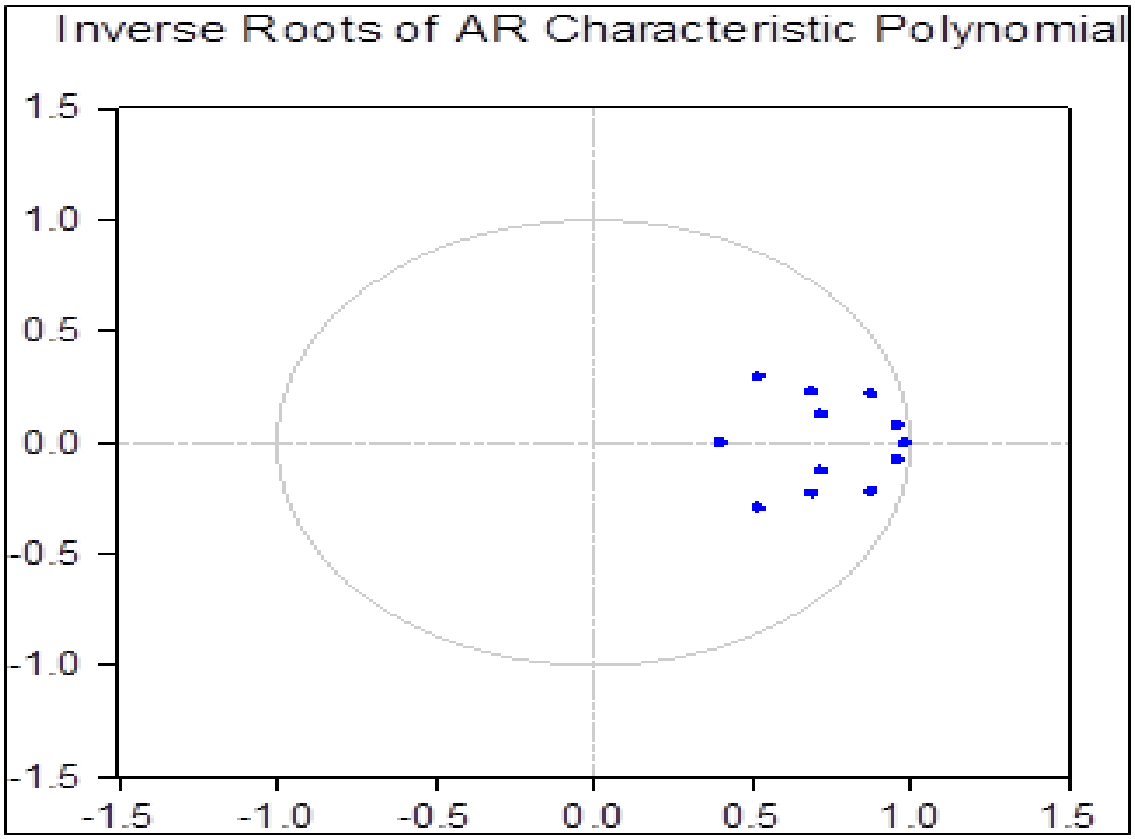
Root	Modulus
0.98	0.98
0.96 - 0.08i	0.96
0.96 + 0.08i	0.96
0.88 - 0.22i	0.91
0.88 + 0.22i	0.91
0.72 - 0.13i	0.73
0.72 + 0.13i	0.73
0.69 - 0.23i	0.73
0.69 + 0.23i	0.73
0.52 - 0.29i	0.60
0.52 + 0.29i	0.60
0.40	0.40

Source: Author's compilation using EViews

For a model to be stable and fit for the VAR, the AR polynomial must have a modulus that is less than one and roots that lie within the circle (Lütkepohl, 1991). If one of them or so is more than one, the model is not stable, and the impulse response and the variance decomposition output will be void as well. The results in table 5.5 indicate that the

modulus is all less than one, thus the model was fit. These results are further supported by figure 5.1 below and indicate that all the roots fall within the circle as indicated.

Figure 5.1: The Stability Condition for the VAR Model

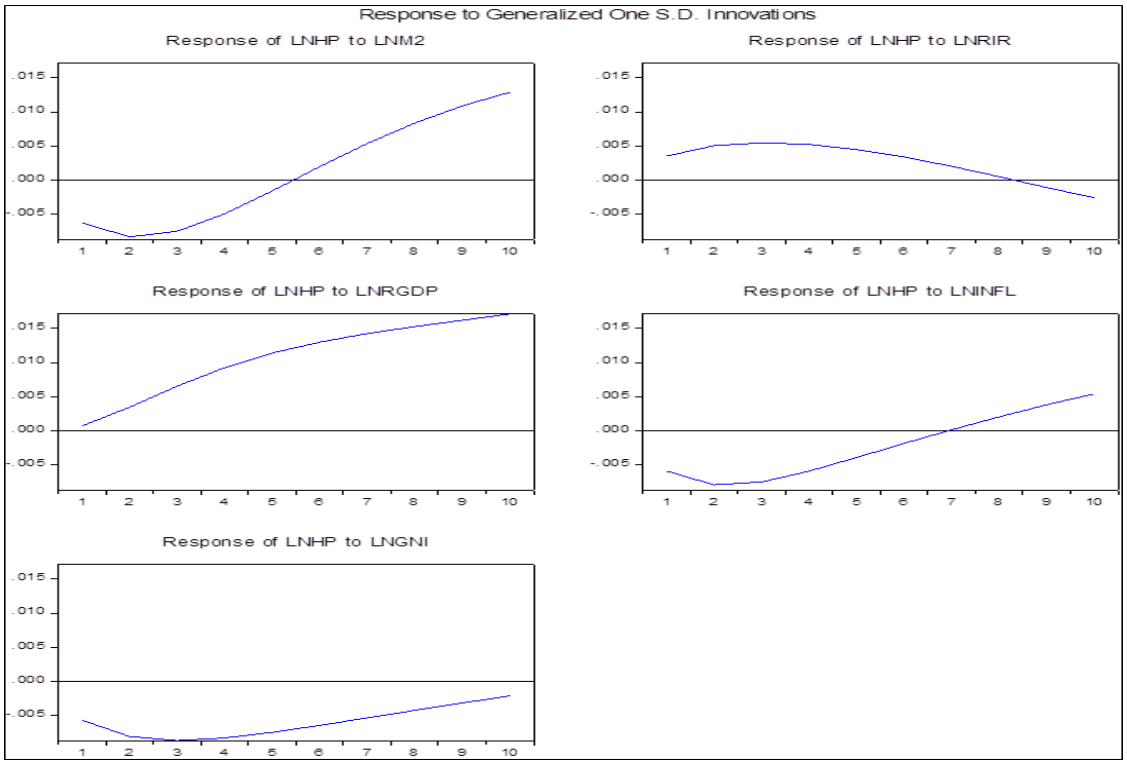


Source: Author's compilation using EViews

After having established the order of integration, co-integration was tested and the lag order, as well as the fitness of the model and the Structural Vector Autoregression (SVAR), was conducted. To capture the innovations between the housing market and the macroeconomic activities in Namibia, restrictions were imposed in the model to assess the impulse response and the variance decomposition of the variables at hand. The impulse response indicated the response of variables to the shocks in other variables. In this case, the impulse response presented in figure 5.2 below display the response of the dependent

variable, house price, to the shocks in the independent variables over a ten-quarter time horizon.

Figure 5.2: Impulse Response of the House Price



Source: Author's compilation using EViews

House prices responded to shocks in all the macroeconomic activity indicators, as shown in figure 5.2 above. Shocks in the money supply increased house prices. The increase in house prices was clear after the second quarter, increasing at a steady rate. After the fourth quarter, the house prices increased at an increasing rate, until the eighth quarter, after which the effect became permanent after the ninth quarter. This positive reaction of house prices to the money supply is in line with theory. An increase in money supply is known to have a positive effect on the housing market through credit availability (Adam & Fuss, 2010).

A shock in real interest rate increased house prices only to reduce it after the second quarter, and the effect seemed to be transitory. House prices started to fall at a decreasing rate after the fifth quarter and the effect became permanent after the ninth quarter. Browning and Crossley (2001) stated that economic agents do not react fast to changes in interest rate. This being the case, the positive reaction in house prices in the first two quarters could have been attributed to the slow reaction by the economic agents in the Namibian housing market. It might be that they started reacting after the second quarter and that might be the reason why house prices started to fall. According to Beltratti and Morana (2010), the interest rate is negatively related to house prices through consumption, thus the negative reaction in house prices from shocks in interest rate was as expected.

The real gross domestic product also increased the house prices in Namibia. The effect of the gross domestic product appeared to be permanent. From the first to almost the fifth quarter house prices were almost constant, increasing at a slow rate. The increase in house prices due to a shock in the real gross domestic product was in line with theory, thus it was expected. As Hepsen and Kalfa (2009) stated, an increase in the economy's productivity increases income and, in the process, increases consumption and wealth. Housing forms part of household consumption and wealth.

Shocks in inflation reduced housing prices below the steady-state in the first two quarters. It increased at an almost constant rate between the second and third quarters, only to pick up by the end of the third quarter. House prices have been increasing ever since and started increasing at a decreasing rate from the seventh quarter. The effects became permanent after the ninth quarter. As stated by Follain (1982), inflation is negatively linked to housing prices. An increase in inflation reduces house prices through the purchasing

power of the economic agents, thus the negative reaction of house prices to shocks in inflation was as expected. The positive reaction to house prices on the other hand was unexpected. This might mean that, after the third quarter, an increase in inflation probably increased the price of houses in Namibia as well, probably through an increase in the demand.

The shocks in the gross national disposable income fluctuated the house prices below the steady-state, and the effects appeared to be permanent. House prices decreased at a slow pace from the first quarter to the third, only to increase at an almost constant rate until the seventh quarter. The effects became permanent after the ninth quarter. Disposable income had a positive impact on the housing market through consumption. The positive reaction of the housing market to shocks in gross disposable income was like the results obtained by Nneji *et al*., (2013), which was in line with the theory. The negative reaction, however, was not in line with the theory. Since disposable income is either saved or consumed, economic agents probably channelled their funds to other financial assets, savings or consumption of other goods and services, thus the negative reaction of house prices.

In addition to the impulse response, the variance decomposition was also conducted, and the output is presented in Table 5.6 below. The variations in the variables were separated into shocks, determining the percentage of alteration in the system that is explained by the dependent variable as well as those that are described by its determinants.

Table 5.6: The Variance Decomposition Output

Variance Decomposition of LNHP							
Period	**S.E.**	**LNHP**	**LNM2**	**LNIR**	**LNRGDP**	**LNINFL**	**LNGNDI**
1	0.01	100	0.00	0.00	0.00	0.00	0.00
4	0.04	85.01	5.55	0.27	6.04	2.80	0.34

6	0.05	66.70	15.14	0.71	10.15	5.96	1.34
8	0.07	49.66	25.22	1.57	12.09	8.55	2.90
10	0.08	36.82	32.57	2.86	12.70	10.45	4.61
Variance Decomposition of LNM2:							
Period	**S.E.**	**LNHP**	**LNM2**	**LNIR**	**LNRGDP**	**LNINFL**	**LNGNDI**
1	0.03	33.00	66.10	0.00	0.00	0.00	0.00
4	0.09	21.74	73.23	2.69	0.83	0.17	1.34
6	0.11	15.78	70.23	7.10	0.72	2.72	3.45
8	0.13	11.38	62.21	11.16	0.69	8.70	5.86
10	0.16	9.39	53.32	13.27	1.72	14.65	7.65
Variance Decomposition of LNIR							
Period	**S.E.**	**LNHP**	**LNM2**	**LNIR**	**LNRGDP**	**LNINFL**	**LNGNDI**
1	0.24	10.65	0.40	88.95	0.00	0.00	0.00
4	0.59	10.42	3.67	80.51	3.01	2.16	0.24
6	0.65	9.43	6.32	77.80	3.94	2.23	0.27
8	0.68	14.28	7.13	72.20	3.74	2.27	0.38
10	0.72	19.57	6.48	65.01	4.58	3.42	0.94
Variance Decomposition of LNRGDP							
Period	**S.E.**	**LNHP**	**LNM2**	**LNIR**	**LNRGDP**	**LNINFL**	**LNGNDI**
1	0.01	0.44	1.25	0.80	97.51	0.00	0.00
4	0.02	2.35	3.07	0.26	93.13	0.92	0.27
6	0.03	4.22	5.07	0.22	85.78	3.84	0.87
8	0.03	4.99	7.47	0.33	78.27	7.16	1.78
10	0.03	4.68	9.96	0.41	72.54	9.25	3.16
Variance Decomposition of LNINFL							
Period	**S.E.**	**LNHP**	**LNM2**	**LNIR**	**LNRGDP**	**LNINFL**	**LNGNDI**
1	0.11	29.67	0.31	3.38	0.43	66.21	0.00
4	0.32	22.96	0.75	7.26	1.46	65.69	1.88
6	0.38	16.81	0.90	10.92	2.22	66.29	2.86
8	0.42	14.97	0.79	13.44	1.98	65.78	3.04
10	0.45	17.10	0.96	14.08	2.11	62.95	2.79
Variance Decomposition of LNGNDI							
Period	**S.E.**	**LNHP**	**LNM2**	**LNIR**	**LNRGDP**	**LNINFL**	**LNGNDI**
1	0.02	27.26	7.70	3.26	22.87	4.71	34.21
4	0.05	27.26	10.52	1.99	17.17	1.94	41.12
6	0.06	23.79	11.18	1.67	15.86	1.97	45.53
8	0.07	20.58	10.87	1.49	15.98	2.33	48.76
10	0.08	18.12	9.93	1.38	16.91	2.71	50.95

Source: Author's compilation using EViews

S.E indicates the forecast error of the variables at the 10-quarter horizon in the SVAR.

Variations in the house prices were due to itself, accounting for 100% in the first quarter.

As the forecast horizon stretched to the fourth quarter, most of the fluctuations in house prices were due to money supply. Although money supply dominated the fluctuations in house prices, the real gross domestic product and inflation also contributed to the fluctuations, especially in the sixth quarter. The gross national disposable income and real interest rate also explained the fluctuations in the housing market after the eighth quarter, accounting for one to five per cent respectively.

Fluctuations in money supply were due to itself as well, accounting for about 66% in the first quarter, increasing and decreasing with the time horizon. The contribution of the housing market to fluctuation in the money supply has been decreasing with the time horizon. In the first quarter, the housing prices contributed 33%, only to fall to 15% in the sixth quarter. It later dropped to less than 10% in the tenth quarter. Other macroeconomic activity variables started contributing after the fourth quarter. Inflation and the real interest rate contributed more to fluctuations in money supply in comparison to any other macroeconomic variables considered in this chapter.

Interest rate also explained fluctuations in itself by more than 88%, higher than any other variable. House prices contributed the second-biggest share, accounting for more than 10% in the first and fourth quarters. Its contribution fell by the sixth quarter only to increase to 19% by the tenth quarter. The other macroeconomic variables, except national disposable income, contributed between 2 and 4%, increasing with the time horizon. National disposable income contributed less than 1% to fluctuations in real interest rate over the 10 quarters.

Fluctuations in the real gross domestic product were due to itself, accounting for 97%. Though this was the case, housing prices also contributed almost 2% in the second quarter,

and its contribution has been increasing with the time horizon. By the end of the tenth quarter, house prices contributed 4.68% to fluctuations in the real gross domestic product. The contributions from the other macroeconomic variables, except for real interest rate, accounted for 1 to 9% of the fluctuations in the real gross domestic product, with money supply contributing the most. The real interest rate accounted for less than 1% of the fluctuations in real gross domestic product.

Inflation was also responsible for most of its fluctuations, accounting for 66% in the first quarter. As the time horizon expanded, its innovations fluctuated around 60%. House prices contributed more to fluctuations in inflation in comparison to other macroeconomic activity variables. It accounted for 29% of the fluctuations in the first quarter. The house price contribution has been falling with the time horizon, accounting for 17% at the end of the tenth quarter. The real interest rate contributed the highest in comparison to other macroeconomic indicators. It contributed 3% in the first quarter, and its contribution has been increasing with the time horizon. The other variables, except for money supply, have been contributing between 1 and 3% over the time horizon. Money supply accounted for less than 1% in the ten quarters.

The gross national disposable income also caused most of its fluctuations, accounting for 34% in the first quarter. Its contribution has been increasing with the time horizon, accounting for more than 50 by the end of the tenth quarter. Housing prices contributed to the second-largest share, accounting for 27% in the first quarter. Its contribution to fluctuations in national disposable income started to fall in the sixth quarter, and it accounted for 17% at the end of the tenth quarter. The real gross domestic product also contributed a fair share to the fluctuation in disposable income. It accounted for 22% in

the first quarter, only to decrease to 16% in the tenth quarter. Money supply also accounted for 7 to 11% of the fluctuations in disposable income in the ten quarters. The other macroeconomic variables contributed between 1 and 4% throughout the ten quarters. After the impulse response and the variance decomposition, the Granger Causality Test was conducted.

5.5.4 The Granger Causality Test

This test is similar to the one carried out in chapter three. The conclusion from the Granger Causality results was made based on the comparisons between the probability variable and the level of confidence. As indicated in chapter three, if the probability value was less than the level of confidence, the null hypothesis of Granger Causality could not be accepted. The results of the causality test are presented in Table 5.7 below.

Table 5.7: Granger Causality Test Results

Null Hypothesis:	**Prob.**
LNM2 does not Granger Cause LNHP	0.03**
LNHP does not Granger Cause LNM2	0.07
LNRIR does not Granger Cause LNHP	0.72
LNHP does not Granger Cause LNRIR	0.46
LNRGDP does not Granger Cause LNHP	0.25
LNHP does not Granger Cause LNRGDP	0.73
LNINFL does not Granger Cause LNHP	0.26
LNHP does not Granger Cause LNINFL	0.17
LNGDNI does not Granger Cause LNHP	0.85
LNHP does not Granger Cause LNGDNI	0.17

*Source: Author's compilation using EViews. Notes: ** means the rejection of the null hypothesis at 5%*

The results suggested that there was a unidirectional causal relationship between macroeconomic indicators and the Namibian house market. The causal impact of macroeconomic activities on the Namibian housing market was clear through the money supply and real gross domestic product. This was an indication that the macroeconomic indicators played a role in predicting the housing prices in Namibia. The other indicators did not Granger cause house prices.

The housing market does not caused the macroeconomic activities in Namibia, as indicated in the results above. The causal relationship between the housing market and macroeconomic activities was similar to that found by Loo *et al*., (2015) in their study on Asia, as well as that of Panagiotidis and Printzis (2016) on the housing market of Greece.

5.6 Summary

This part of the study investigated the relationship between the housing market and the macroeconomic indicators in Namibia between 1995 and 2016. The Bound co-integration test indicated that there is a long-run co-integrating relationship between the house price index and the macroeconomic activities. After that, the Structural Vector Autoregressive (SVAR) Model was adopted to obtain the impulse response of the house price to shocks in the macroeconomic indicators. The results indicated that there was indeed a relationship between the housing market and the macroeconomic indicators in Namibia. Specifically, house prices reacted positively to shocks in the money supply, real gross domestic product, inflation and gross national disposable income. The interest rate on the other hand indicated mixed results, increasing house prices only to reduce them later.

Also, the variance decomposition test was conducted. The results also indicated that the housing market and the macroeconomic indicators explained the fluctuations in each other in Namibia. On the one hand, the results showed that fluctuations in house prices are mostly explained by money supply, real gross domestic product and inflation in comparison to other macroeconomic activity variables. On the other hand, the housing market made it possible to explain the fluctuations in the macroeconomic activities, mostly through money supply, real interest rate, inflation and gross national disposable income. The fluctuations in the gross domestic product were mostly brought about by money supply and inflation.

The Granger Causality Test was also conducted; the results suggested that there was a uni-directional causal relationship between the housing market and the macroeconomic activities in Namibia. This causal relationship was running from the money supply towards the housing market.

Chapter Six: Conclusion and Policy Recommendations

6.1. Introduction

This chapter summarizes the whole thesis. Firstly, the summary of the empirical findings from chapters three, four and five are presented. These are the findings that were used for policy implications. Secondly, the study summarizes the contribution of this study to literature on this subject and policy recommendations. The third part of this chapter discusses the limitations and areas for further research.

6.2. Summary of findings

This researcher investigated the dynamic interaction between the macroeconomic indicators and the asset markets in Namibia between 1995 and 2018, using quarterly data. Before the relationship between the asset markets and macroeconomic indicators was tested, the study gave an overview of the macroeconomic indicators in Namibia along with the performance of the three selected asset markets. The selected ten macroeconomic activity indicators had been fluctuating between 1995 and 2018. Chapter two presents an overview of the stock market. Information presented under this subsection also indicated fluctuations in the stock prices, which was used as a proxy for the Namibian stock market.

Similarly, the overview of the foreign exchange market is presented in chapter two, where the overall outlook of the foreign exchange market as well as the performance is presented. There was also an indication of fluctuation in the foreign exchange market, through the real exchange rate. An overview of the housing market in Namibia is also presented. There was an indication of fluctuations in the housing market as well. An overview of the Namibian financial market is discussed. Here, an overview of the performance in the

Namibian financial market is presented. Additionally, entities in the Namibian financial market are also presented under this subsection, giving an overview of how they operate. Lastly, an overview of the Namibian monetary policy is presented.

After the overview of the macroeconomic indicators and the asset markets in Namibia, the first objective of the study was tested. The first overall objective was to assess the relationship between the Namibian stock exchange market and macroeconomic indicators. This part of the study investigated three specific objectives, linked to the main objective of chapter three. The first specific objective of chapter three was to assess the presence of volatility in the Namibian stock exchange market. The ARCH/GARCH models were conducted to assess the presence of volatility in the Namibian stock exchange. The results revealed that there was no volatility in the Namibian stock exchange. This means that the stock market in Namibia did not suffer from unexpected changes.

After the volatility test, the second specific objective was tested, using the ARDL Bound test of co-integration. The results indicated that there was co-integration amongst the variables in this model. With the presence of co-integration, the ECM Model was conducted. The results of the ECM suggested that there was indeed a short- and long-run relationship between the Namibian stock market and the macroeconomic indicators. To be specific, macroeconomic indicators had a significant impact on the Namibian stock exchange rates through real exchange rates. An appreciation of the Namibian dollar due to changes in the exchange rates increased activities in the stock market in the long run. Since the relationship is positive, it might be that the financial goods and services in the Namibian Stock Market become attractive with the appreciation of the Namibian dollar. The other macroeconomic activity variables such as industrial production and money

supply had a long-run positive impact on the Namibian Stock Market, but it was statistically insignificant. The inflation rate and real interest rates had a negative statistically insignificant impact on the Namibian Stock Market in the long run. In the short run, money supply, inflation, real exchange rate and industrial production significantly influenced the Namibian stock market.

The last part of chapter three assessed the causal relationship between the Namibian stock market and macroeconomic indicators. The results from the Granger Causality Test suggested that there was indeed a unidirectional causal relationship between the Namibian Stock Exchange and the macroeconomic indicators. It was suggested that, on the one hand, changes in the industrial production and or money supply will help explain fluctuations in the Namibian Stock Market. On the other hand, the Namibian Stock Market is only able to explain changes in the macroeconomy through the real interest rate.

The results from the three specific tests conducted in chapter three confirmed and quantified that there was indeed a relationship between the Namibian Stock Exchange and the macroeconomic indicators. This relationship ran from the short run toward the long run. The Null hypothesis of no relationship between the Namibian Stock Market and the macroeconomic activities was therefore not accepted.

Chapter four investigated the relationship between the foreign exchange market and the macroeconomic indicators in Namibia. The main objective of this chapter was to assess the relationship between the foreign exchange market and macroeconomic indicators in Namibia. Chapter four had three specific objectives aimed at quantifying the relationship between the foreign exchange market and macroeconomic indicators. The first objective was to assess the presence of volatility in the foreign exchange market. To test for the

presence of volatility, the ARCH, GARCH, TGARCH and the EGARCH Models were used as informed by literature.

The results indicated that the Namibian Foreign Exchange Market was volatile. The results further showed that the volatility in the foreign exchange market was only present in the short run. The results further suggested that volatility does respond to news in the Namibian economy and investors do respond to news on anything that affects the foreign exchange market of the Namibian economy. Specifically, the good news that strengthens the Namibian dollar increases volatility in the Namibian foreign exchange market, through adjusting the real exchange rates.

With the presence of volatility, the second specific objective was to test for the relationship between volatility and macroeconomic indicators in Namibia. The co-integration test along with the ECM tests was used. The results indicated that there was indeed a short- and long-run relationship between the volatility in the foreign exchange market and macroeconomic indicators. To be specific, volatility can be influenced significantly by government expenditure in Namibia. An increase in government expenditure would increase volatility in the foreign exchange market, in the short run. The other macroeconomic indicators played roles too, but their impact was statistically insignificant.

In addition to the tests of volatility and its relation to the macroeconomic indicators, the relationship between the foreign exchange market and the macroeconomic indicators was investigated. The ECM model was conducted to achieve this specific objective. The results indicated that there was a long- and short-run relationship between the foreign exchange market and macroeconomic activities. All the macroeconomic indicators considered in the model can explain the foreign exchange market significantly. Changes

in industrial production and money supply would improve the foreign exchange market. Changes in government expenditure, however, would have a negative impact on the foreign market.

The results showed that there was indeed a relationship between the foreign exchange market and the macroeconomic indicators in Namibia. Not only that, but the results also suggested that the Namibian Foreign Exchange Market was volatile. This volatility can also be explained by the macroeconomic activities in Namibia. The null hypothesis of no relationship between the foreign exchange market and macroeconomic activities in Namibia could not be rejected.

Chapter five of the thesis investigated the relationship between the housing market and the macroeconomic indicators in Namibia. The main objective here was to assess the impact between the housing market and the macroeconomic indicators as well as the direction of the impact. The SVAR model was adopted to assess the existence of the relationship in Namibia. Additionally, the Bound Co-integration Test was conducted to determine whether the variable converges to the equilibrium in the long run. The results indicated that there was convergence of the variables considered in this chapter in the long run.

After the co-integration test, the SVAR test was conducted. The idea behind conducting the SVAR test was to obtain the impulse response and the forecast error variance decomposition. The impulse response test was conducted to assess how the housing market responded to shocks in the macroeconomic activity indicators adopted in this chapter. It turned out that the housing market responded to shocks in macroeconomic indicators. To be specific, shocks in the money supply, inflation rate, gross domestic

product and gross national disposable income increased the housing prices. Shocks in real interest rates, however, had a negative impact on the housing market.

Furthermore, the forecast error variance decomposition test results indicated that on the one hand, the fluctuations in the Namibian housing market could indeed be explained by the macroeconomic activity indicators used in this chapter. Although most of the fluctuations in the housing market were due to itself, the macroeconomic indicators contributed fairly. The macroeconomic activity indicator that contributed the most was the money supply.

On the other hand, the results indicated that the housing market could help explain the fluctuations in the macroeconomic indicators in Namibia. The influence of the housing market on the fluctuations in the macroeconomic activities was seen in all the indicators used in this chapter. The housing market mainly brought fluctuations in the macroeconomic activities through money supply, inflation and gross national disposable income in the Namibian economy.

The Granger Causality Test was also used. It was used to assess the causal relationship between the housing market and macroeconomic activities. The results suggested that there was a uni-directional causal relationship between the housing market and macroeconomic indicators in Namibia. This relationship was running from the money supply to the housing market.

All these tests quantified the relationship between the housing market and macroeconomic indicators in Namibia. The null hypothesis of no relationship between the housing market

and macroeconomic indicators was therefore rejected and concluded that there was indeed a relationship.

In conclusion, all these empirical results indicated that the macroeconomic indicators and the asset markets in Namibia were interrelated. The thesis made use of three asset markets in Namibia, the stock market, the foreign exchange market and the housing market. The study adopted the PP and the KPSS methodologies for unit root. Additionally, the ARCH, GARCH, TGARCH and EGARCH Tests were conducted to assess for the presence of volatility in the asset market. Furthermore, the ARDL, the ECM and the SVAR Tests were conducted to test for the relationship between the macroeconomic indicators and the asset markets in Namibia.

6.3. Policy Implications

The empirical results of the study indicated that macroeconomic indicators and the asset markets in Namibia are interdependent. Like any other economy, Namibia strives to reduce unemployment through the promotion of productivity and a stable financial environment, amongst other macroeconomic goals. The empirical results of this thesis indicated that macroeconomic objectives can therefore be promoted through the stock market, the foreign exchange market as well as the housing market in the Namibian economy. Similarly, stable financial asset markets can be promoted through macroeconomic activities in the Namibian economy.

When policymakers want to promote macroeconomic activities through the stock market, they can focus on real interest rates in the short run. According to empirical data, the stock market helps to explain the macroeconomic activities through real interest rates in

comparison to other indicators in Namibia. Specifically, the results indicated a negative relationship between the interest market and the stock market. An increase in the stock prices of the Namibian Stock Exchange should be accompanied by a contraction monetary policy where the Bank of Namibia reduces the repo rate. The reduction in the repo rate will increase credit availability, which in turn will increase consumption and improve industrial production. The increase in money supply and industrial production will increase investments in the Namibian Stock Exchange, which will consequently improve the Namibian stock exchange.

Similarly, the Namibian economy can improve the Namibian Stock Exchange through the real exchange rate. The results indicated a positive relationship between the stock prices and the real exchange rates. This is an indication that an appreciation of the Namibian dollar will make the stocks in the Namibian Stock Market more attractive to investors, as explained by the CAPM theory. Although the Namibian Stock Exchange is a non-profit-oriented entity for growth, the expansion of the Bank of Namibia can increase the real exchange rate to attract investors into the Namibian Stock Exchange. This decision has to be made in line with the common monetary area regulations. An improvement in the Namibian Stock Exchange can earn profits for the local companies registered. In the process, this will increase employment through an increase in the real gross domestic product.

Macroeconomic objectives can also be promoted by the foreign market in Namibia. Empirical data show that real exchange rates in Namibia are positively related to industrial production, money supply as well as terms of trade. To promote the macroeconomic objectives through the foreign exchange market, the Bank of Namibia can adopt a

contractionary monetary policy, where they reduce the repo rate. This is relevant to the Namibian economy since the Bank of Namibia mostly changes the repo rate. This reduction in interest rates will increase investments, according to theory. This will in turn increase the purchase of financial assets, improving the Namibian financial infrastructure in the process. An increase in investment will also increase economic growth through productivity. Similarly, a reduction of interest rate increases the money supply, which in turn will increase real gross domestic product through consumption. An increase in the money supply will increase the consumption of imported goods and services by the residents. As a result, this will decrease the industrial production in Namibia and increase the ratio of imports into Namibia against the Namibian exports. This process might also devaluate the Namibian dollar. If this happens, the Namibian government can adopt a contractionary fiscal policy by reducing government expenditure. The results indicated a negative relationship between the real exchange rates and the government expenditure in Namibia. This will, therefore, increase the real exchange rates, pushing the Namibian dollar back up.

However, it is important to note that the Namibian Foreign Exchange market is volatile. The empirical results indicated that the volatility in the Namibian foreign market depends on government expenditure. An increase in government expenditure in Namibia will increase the volatility in the exchange rates. In cases where the Bank of Namibia wants to control the volatilities of the Namibian dollar, the Namibian government can apply a constructional fiscal policy. This is relevant to the Namibian economy since now and then the government adopts a fiscal policy.

The empirical results of the study also indicated that economic activities can be promoted through the housing market in Namibia. The housing market promotes economic activities through the money supply and gross disposable income in comparison to any other indicators. This is an indication that economic agents in Namibia depend on transacting properties for revenue. The government can therefore promote the production of cheap mass housing to promote property investment. This will increase income and, in the process, promote economic growth in Namibia. It is important to note that data indicated an increase in house prices in Namibia, countrywide, between 1995 and 2016. As was the case in the United States between 2007 and 2009, an increase in housing prices can lead to a bubble, which might lead to financial instabilities. To avoid this from happening to the Namibian economy, the Bank of Namibia can implement a contractionary monetary policy, on the one hand. This will reduce the money supply and reduce credit availability. In the process, this will reduce the purchase of houses. If the demand for housing falls against a constant supply of houses, the price will fall. On the other hand, the Namibian government will need to increase the supply of houses in the Namibian economy by making funds available through the ministry of urban and rural development. An increase in the supply of houses will shift the supply curve, reducing the housing prices in the process. This can be done through a monetary policy contraction, where the Bank of Namibia reduces the repo rate.

The use of monetary policy, exchange rate policies and fiscal policy to adjust possible external imbalances is common (Bonga-Bonga, 2019). Nwoko, Ihemeje and Anumadu (2016) investigated the impact of monetary policy on economic growth in Nigeria. The scholar found the monetary policy to be effective in promoting economic growth.

Increasing the money supply could improve the capital market as well as the monetary system.

Bonga-Bonga (2019) stated that countries with high import dependency, such as Namibia, could benefit from currency appreciations. Evidence from Nigeria, South Africa and Egypt showed that currency appreciation causes current account surpluses. On the one hand, contractionary monetary policy will promote economic growth through currency appreciation and investment. On the other hand, a reduction in interest rate would stimulate economic growth through domestic consumption. This is however contributes to the current account deficit, especially for economies with a weak currency (Bonga-Bonga, 2019).

Fasoye (2019) indicated that fiscal policy is one of the imports tools the government can use to promote macroeconomic objectives. This is most applicable to economies vulnerable to external shocks. High government expenditure crowd-out private investment through its impact on the interest rate (Das, 2018). Although that is the case, Das (2018) found that contractionary fiscal policy reduced investment in most of the states in India. All these scholars quantify the use of the monetary policy, the exchange rate policies as well as the monetary policy.

6.4. Limitations of the Study and Areas for Further Research

As indicated in chapter one, this study faced limitations. The limitation of this study was that the study made use of data from 1995 to 2018. This was mainly because data availability for some variables started only after 1990. Furthermore, there were many macroeconomic indicators of which not all could be used and/or incorporated in this study

alone. Thus, the study made use of ten indicators. The results might not have given a full reflection of the macroeconomic activity reaction because the study did not make use of all the macroeconomic indicators.

Namibia is still a small upcoming economy and most information is limited. Due to the lack of information and literature on other asset markets, the study made use of three asset markets in Namibia. Thus, the study did not make use of all the variables in three asset markets, and as a result, the results might not be the full reflection of the asset markets in the Namibian economy.

That being the case, the findings of the thesis raised three concerns regarding the Namibian economy. Firstly, there was an indication that the housing prices in Namibia had been increasing over time. An increase in house prices creates a bubble, which, if it bursts, will lead to financial instability So far, studies on the housing market in Namibia are limited. There is a need to research testing for the feasibility and the possibility of the house price bubble in Namibia.

Secondly, the Namibian Foreign Exchange Market indicated the presence of volatility. The thesis only adopted five indicators to assess the relationship between the volatility in the foreign exchange market and macroeconomic activities. The results indicated that these two indicators only account for 16% of the variations in the foreign exchange market, with 84% captured by other variables not captured in the model. There is a need for further research on volatility in the Namibian Foreign Exchange Market, capturing other macroeconomic activity indicators in Namibia. Thirdly, there is a chance that the asset markets in Namibia are interrelated through the macroeconomic indicators. There is a need for research on the dynamic interaction of the financial and asset markets in

Namibia. This will assess the relationship between the financial and asset markets in Namibia.

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