AN ECONOMETRIC ANALYSIS OF THE IMPACT OF IMPORTS ON INFLATION IN NAMIBIA

By

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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ABBREVIATIONS AND ACRONYMS

ADF	: Augmented Dickey Fuller
ARDC	: Autoregressive Distributed Lag Model
BON	: Bank of Namibia
CPI	: Consumer Price Index
FDI	: Foreign Direct Investment
FEVD	: Forecast Error Vector Decomposition
GDP	: Gross Domestic Product
IMF	: International Monetary Fund
IRF	: Impulse Response Function
LN	: Natural Logarithm
M2	: Broad Money Supply
NKPC	: New Keynesian Philips Curve
NRH	: Natural Rate Hypothesis
NSA	: Namibia Statistics Agency
OECD	: Organisation for Economic Cooperation and Development
OLS	: Ordinary Least Squares
PP	: Phillips-Peron
SA	: South Africa
UK	: United Kingdom
UNTAG	: United Nations Transition Assistance Group
USA	: United States of America
VAT	: Value Added Tax
VECM	: Vector Error Correction Model
WWS	: Wide Sense Stationary

ABSTRACT

This study investigated the impact of import prices on inflation in Namibia, using quarterly time series data over the period 1998Q2-2017Q4. The variables used in the study are inflation rate, M2, real GDP and import prices. The study found that all the variables are integrated of order one (1), and upon testing for cointegration using Johansen test, there was no cointegration. Therefore, the model was analysed using ordinary least squares (OLS) techniques of vector autoregression (VAR) approach, granger causality test and the impulse response function. The results of the study revealed that import prices granger causes inflation at 1% level of significance. Inflation is also granger caused by real GDP and broad money supply (M2) does not Granger cause inflation. The study further revealed that the shocks to import prices are significant in explaining variation in inflation both in the short run and in the long term.

Key terms:

Inflation, inflation rate, import, import price index, import value index.

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CHAPTER ONE: INTRODUCTION

1.1. BACKGROUND

Economists defined inflation as an increase in the average price of goods and services within the economy. In many countries (including Namibia), inflation is measured using the consumer price index (CPI). The consumer price index considered a weighted-average of different goods and services bought by the average household, (the list of goods and services to be included in the CPI is obtained from household surveys). The average price of goods and services does not necessarily have to rise simultaneously to indicate inflation. The individual effects in this regard depended on how closely the basket of goods and services in the index matched the household purchasing patterns (Canetti and Greene, 1991).

Imports are foreign goods and services bought by residents of a country (Amadeo, 2018). Residents that purchased and consumed imports included citizens, businesses and the government (Amadeo, 2018). How the goods or services entered the country's territory does not matter because, any mode of transport could bring the goods or services into the country's territory. The goods or services couldf enter the country via the sea, air, post or as an individual baggage. It was also important to note that imports cannot be explained in isolation and thus it was necessary to define exports. According to Greenaway and Shaw (1988), exports are goods produced in one country and traded or consumed in another country.

According to the study by Ogbokor and Sunde (2011), inflation in Namibia is import driven. The study suggested that, Namibia is a net importer of most of the goods consumed in within the country.. There are two sides of the effects of imports on domestic price levels. According to Brian and Howard (2015), imports have significant effects on daily livelihood because they exerted on the consumer and the economy at large. An increase in the number of imported goods reduces domestic demand-pull inflation (Islam, 2013). Subsequently, a rise in import spending reduces net exports and aggregate demand on domestic goods before finally, reducing domestic inflationary pressure (Ogbokor & Sunde 2011). On the other hand, Pettinger (2009) observed that a rise in imports occured when there was an increase in general spending, and the increase in imports echo the inflationary pressure in the economy. As a result, consumers (who are suppliers of factor of productions) would be pushed into higher income brackets unless the tax rates are adjusted with inflation (Canavese, 1982). This transition is called tax trap. Tax trap is defined as a situation where, a supplier of factors of production moves into upper tax groups as a result of increase in remunerations to be at par with inflation.

1.2. PROBLEM STATEMENT

Inflation has been a problem in most parts of the world for some decades. Due to the high inflation rate experienced in several countries in the past years, global economic activities have declined, which have resulted in adverse operating conditions for most businesses in Namibia. Many employees were declared redundant, and most businesses were forced to downsize their employee's number. Some businesses were even forced to close down, for example, Otjihase Exploring Company. This was because of the universe that was speedily transforming into a global community. In this revolution, it was essential to understand how international developments such as cross-border trade and prices of imported goods influenced the level of domestic prices.

A general increase in the price level of an economy over a period of time might have severe consequences. These might include the slowdown of economic activities and erosion of the national currency, making inflation a disturbing phenomenon (Islam, 2013). In addition, if the country has higher inflation rates than it is trading partners, it would cause, for instance, Namibia to buy more of the imported goods as local goods and services would become more costly compared to that of the trading partners (Munepapa and Sheefani, 2017). To illustrate, an increase in imports may cause the depreciation in the rate of exchange, so this inflationary pressure could be managed by increasing the cost of imports (Dexter et al, 2005). A loss in the competitiveness as caused by the dependency on the external goods and services for domestic consumptions would severely harm the economy (Munepapa and Sheefani, 2017). If the country imports most of it is raw materials, it will cause the local currency to depreciates. Subsequently, this will makes the imports pricy (Dexter et al, 2005). As a result, the cost of production of finished goods increases because of the increase of raw materials' cost; thus, higher imports inclined to escalate the inflation. However, an increase in exports instigates the appreciation of local currency, and it tended to reduce the inflation (Ahmed et al, 2018).

Inflation is a crucial concern that central banks addressed in order to achieve price stability. This wasbecause highly volatile inflation rate has the tendency to distort price mechanisms, resulting in inefficient allocation of resources (Islam, 2013). Thus, it would be difficult to distinguish price movement related to changes in the demand and supply for particular goods and services from a general in-crease in the price level. Continuous fluctuation in prices would lead to uncertainty in future prices (Ahmed and Mortaza, 2005). As a result, it would encourage people to spend rather than save. Saving would be of little interest because of the time value of money (unless invested in the stock market).

Unpredictable price fluctuations might have caused labour unrest, as workers would be uncertain that the current wages and salaries could cover future prices on goods and services (Farah and Mortaza, 2009). The increase in inflation makes every individual unhappy due to the decrease in purchasing power of wages, corroding the living standards, and worse off the life uncertainties in many ways (Ahmed et al, 2018). Therefore, there is a need to analyse the impact of import on inflation in Namibia and draw some recommendations.

1.3. RESEARCH OBJECTIVES

The objectives of the study stemmed from the challenges that Namibia faces, regarding inflation rate and the importance of it is determinants. The objectives of this study is:

a) To observe the direction of causality between inflation rate and import prices.
b) To examine the impact of import prices on inflation rate.
c) To observe the effect of a shock in import prices on inflation rate.
d) To present and discuss import economic policy implications.

1.4. SIGNIFICANCE OF THE STUDY

There is a need to investigate the impact of import prices on inflation in Namibia to add further understanding to the literature on these traits. Firstly, the study would update the literature on the topic with regards to the data and time period to validate previous findings. Other studies have used annual data that have ended in 2007. Secondly, the study will help policy makers discover the root cause of imported inflation and come up with appropriate policies that cushion Namibians against imported inflation. The aim is to manage the negative effects of imported inflation that are surfaced in Namibia in the form of increased unemployment, poverty and declined of welfare. The study used several econometric techniques such as Augmented Dickey-Fuller (ADF) unit root test, univariate co-integration test, variance autoregression (VAR), impulse response function, forecast error decomposition and granger causality instead of the single equation, to better understand the impact of import prices on inflation in Namibia. Thirdly, a key challenge facing the country is to come up with policies that protect the economy from shocks of import prices. This study will help policymakers with readymade shock absorbers against import shocks on prices. The study would enrich and add to the already existing economic policies for managing imported inflation. The study will highlight the shortcomings of the current import regime and thus sharpen it to better manage import inflation in Namibia.

1.5. STRUCTURE OF THE STUDY

The study comprises of six chapters. Chapter one introduced the research problem and the objectives of the study. Chapter two offered some stylised facts on the trends in import prices and inflation in Namibia. Chapter three reviewed the relevant literature on the import prices and inflation dynamics. Chapter four outlined the data sources and the methodology employed in the analysis. The empirical analysis and presentation of results are presented in chapter five. Lastly, chapter six provides general conclusions and policy recommendations.

CHAPTER TWO: AN OVERVIEW OF THE MOVEMENTS IN IMPORTS AND INFLATION IN NAMIBIA: 1990 to 2016:

This chapter provides an overview of the economic background of Namibia, focusing on the recent developments in import prices and the inflation rate in Namibia.

2.1. GENERAL DEVELOPMENT IN THE NAMIBIAN ECONOMY

There were various observations in Namibia on which aspects determine low to reasonable inflation. Low or reasonable inflation rate might be attributed to fluctuations in real demand for goods and services, or variations in available supplies. In addition, shortages of some commodities such as maize in some years and changes in the velocity of money supply have also contributed to low or moderate inflation. However, the consensus observation is that a long sustainable period of inflation was as a result of money supply expanding quicker than the GDP growth (Clarida, Gali & Gertler, 1999).

Namibia is an open economy with domestic consumption generally geared to import. The economic contraction in countries such as the United States of America that was experienced in the late 2000s affected the Namibian economy in several ways. One classical example was fluctuation in prices of major imported commodities. The cost of petroleum imports for example, drastically went up from US$ 38.28 per barrel in 2004 to US$ 96.85 per barrel in 2008 (UNDP, 2010). The notable increase in oil prices prompted significant price increases in many goods as changes in oil price often triggers changes in production costs and distribution costs. The crisis therefore affected the wellbeing of most households because domestic producers increased the prices of goods in tandem to increases in the prices of imports. This was evident in the increase in annual inflation rates from 6.7% in 2007 to 10.3% in 2008.

In order to curb further economic crisis, the Namibian government introduced several measures. These measures included zero-rating Value Added Tax (VAT) on basic food commodities such as bread, cooking oil, maize, maize meal, rebate provision for food importers as well as other tax and non-tax mechanisms such as constant revision and communication of new monetary measures, maintaining the fixed peg exchange rate on the South Africa rand and stabilising interest rates (BoN, 2008). Early 2008, the Namibia government through the central bank further implemented these monetary measures, to ensure stability in the domestic prices and sustain economic productivity. As part of the monetary policy framework, the Namibian Dollar was pegged against the South African Rand. Therefore, this link calls for the Namibian Dollar in circulation to be backed up by Rand and enough gold reserves to ensure that Namibia imports are stable against inflation from South Africa and still allow it to adhere to Common

Monetary Area (CMA) conditions (BoN, 2008). Namibia monetary policy framework focused on interest rates and asset prices such as, bonds as effective instruments to implement monetary policy. This is due to the characteristics of Namibia's securities market and adoption of fixed exchange rate regime. The Namibian dollar is fixed against South African Rand which runs Namibia's money market. It was also important to note that, even though Namibia's monetary policy is aligned to that of South Africa, to a lesser extent, Namibia's policies could diverge from that of South Africa to stabilise domestically induced inflation.

2.2. OVERVIEW OF THE DEVELOPMENT OF IMPORTS AND INFLATION

The high inflation experienced during the 1970's across different economies of the world prompted most central banks' to focus on inflation control mechanisms. Namibia registered a significant increase in inflation rate between 1991 and 1992 (figure 1)

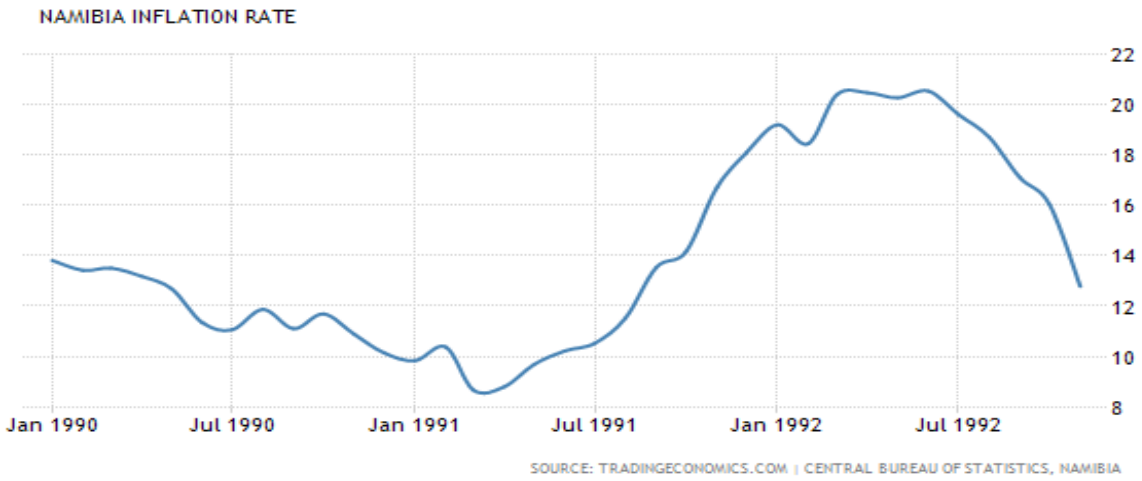

FIGURE 1: NAMIBIA HISTORICAL INFLATION, 1990-1992

Generally, economists had a preference for a low and stable rate of inflation. The duty of maintaining a low and steady rate of inflation is commonly dedicated to monetary regulators. Typically, these regulatory authorities are the central banks. Central banks oversee monetary policy via monetary instruments such as, interest rates, open market operations and setting the bank reserve requirements. A High inflation rates is considered toxic to the overall performance of the economy (Dexter, 2005). High inflation rate often necessitate the government to impose a hidden tax.

Figure 2 below shows the annual trend of the inflation rate and import value in Namibia from 1998 until 2016.

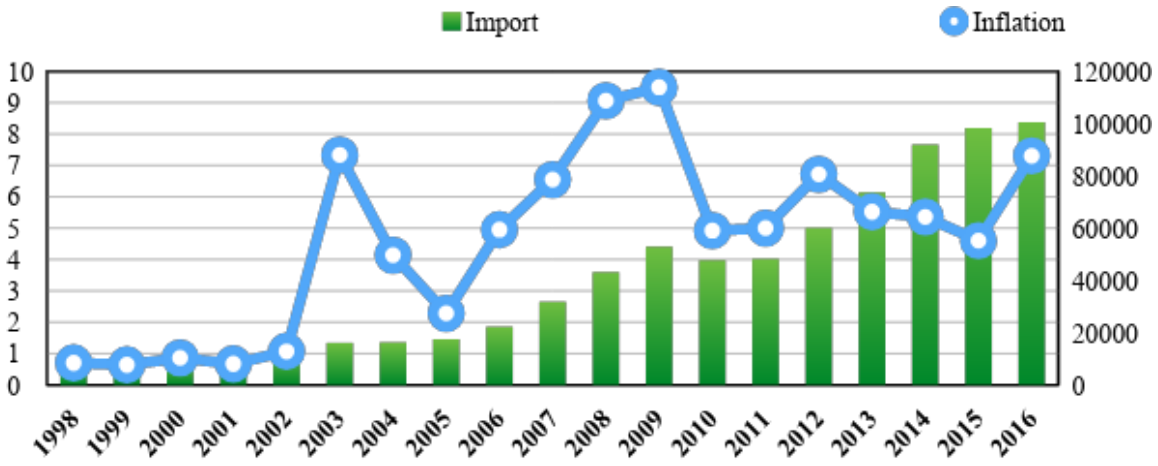

FIGURE 2: GRAPHICAL REPRESENTATION OF INFLATION AND IMPORT TREND IN NAMIBIA

Source: Authors compilation, Data: NSA

During the period under consideration, the annual inflation rate varied between 0.6% and 9.5%. The lowest inflation rate in Namibia was noted at 0.6% in 1999 with the highest recorded at 9.5% in 2009 (BoN, 2009). The low inflation rate recorded in 1999 was necessitated by favorable macroeconomic conditions such as stable domestic currency and declining interest rates experienced during that year (BoN, 1999). The peak in inflation rate experienced in 2009, was mainly due to the increase in international oil prices, cyclical drought, currency depreciation, extra levy on imports and domestic demand pressure due to the presence of Transition Assistance Group (UNTAG) (BoN, 2009).

The inflation rate in 2016 stood at 6.7% (NSA, 2016). Food and non-alcoholic beverages, housing, water, electricity, gas and other fuels, and transport categories were among the main contributors to inflation (NSA, 2013). Major components of goods that formed part of the consumer price index (CPI) basket are imports because Namibia imported most of it is goods that are included in the CPI index calculations. Any increase in their prices would be reflected in the national CPI. Inflation was relatively low from 1998 to 2002. During this period, import value was at par with inflation rate, but at some instances, the percentage increase in inflation rate superseded the percentage increase on import value. This variation might have been due to the instability in oil prices and fluctuation of the Rand against major currencies

such as USD. The value of import and inflation rate started to increase rapidly from 2003 with varying margins. In 2003, inflation moved up to 7.5% while imports value remained below N$27,500. In 2004, the inflation rate remained above imports value but later decreased to be at par with imports value in 2005. From 2006 to 2009, inflation was rising consistently as import value increased. Import value rose from N$27 million to N$55 million while inflation rose from 5% to 10%. However in 2010 and 2011, inflation dropped to be at par with import value. During these two years inflation remained at 4.5%, only to rise to 7% in 2012 as import value rose slightly above N$55 000. From 2013 to 2015 inflation decreased from 5% to 4.5% while import values arose from N$71, 5 million to above N$82, 5 million. In 2016, inflation rose to 7.5% as import value rose from N$98 million to 99 000.

CHAPTER THREE: LITERATURE REVIEW

This chapter presents the theoretical and empirical literatures regarding import prices and inflation dynamics. Section 3.1 explores the definitions of inflation, section 3.2 discusses measures of inflation and section 3.3 provides the empirical evidence on the subject matter. The last section, section 3.4, gives the summary of this chapter.

3.1. DEFINITION OF INFLATION

Definition of inflation varied among different academics. However, though the definitions are relatively not the same, the key concepts of all the definitions are identical and all scholars agree that inflation depicts the rising of prices. The Economics Concept (2012) explained inflation as a situation where prices of goods and services included in CPI computation basket increases. This basket represents all the prices in the economy. This definition implies that, in the process, this increase is felt in the whole economy and not just in one section of the economy. In addition, inflation may also be expressed in terms of rising price level of thinner group of assets, goods or services in the economy, for instance commodities (including food, fuel, metals), tangible assets (such as real estate), financial assets (such as stocks, bonds), services (such as entertainment and health care), or labour. Even though capital assets value are often informally believed to rise, this is not the same with the definition of inflation. This is because, an accurate depiction of increase in capital asset value is referred to as appreciation rather than inflation (Bhamani et al, 2012).

Ahmed and Mortaza (2005) viewed inflation as an upward movement in the average level of prices. The authors further explored inflation by comparing it with deflation which they define as a downward movement in the average level of prices. This definitions however lacks objectivity because it does not reveal if price changes happen in a short period of time or in a continuous trend. In that light, this definition will imply that even price fluctuations may be regarded as inflation. On the other hand, Aktarizzam (2006) gave a much broader definition by looking at inflation as an economic condition where the price of goods and services tend to suddenly increase in relation with money purchasing power, while the supply of the goods and services decline along with the depreciation of money. This definition agrees with the view that inflation occurs as prices rise, purchasing power decreases and there is also a decrease in the supply of goods and services. This definition implicitly show that inflation results in poverty because people's income purchases fewer things (decrease in purchasing power).

Aktarizzam (2006) definition brought into sight the time effect of price changes. The author sees inflation as a condition in which there is a sustained, inordinate (excessive) and general increase in prices. Aktarizzm (2006) further argues that inflation implies a continuous fall in the value of money as there is too much money chasing after too few goods. This definition shows that inflation is different from price fluctuations which just last for a short time. The increase in prices must last for a reasonable period of time to be considered as inflation. If prices goes up for instance during this period and fall in the next, then it is merely a price fluctuation (Mortaza, 2005). The definition also implies that the increase in prices must be excessive by that country's experience. Although the view by Mortza (2006) that the rise of prices must be excessive is controversial since the term ‘excessive’ may imply different things to people of different incomes, the definition tend to be standard as it reveals that inflation is the increase in average price of goods and services within a country over a period of time.

Khanon and Rhaman (2010) explained inflation as a situation when prices continue to creep upward, usually as a result of overheated economic growth or too much capital in the market chasing too few opportunities. This definition also brings the view of continuity effects which dismisses price fluctuations as not being inflation. Similarly, Khanon and Rhaman (2010) also expounds inflation definition by explaining the causes of inflation of which is as a result of overheated economic growth and too much capital chasing too few opportunities. The scope of this definition tends to be narrow as it implies that inflation is always caused by economic growth. Indeed, sometimes inflation happens in an economy that is stagnant. The authors further substantiate their definition by adding that, during inflation, wages creep upwards but more slowly than the prices which results in the standard of living decreasing.

From the above definitions, one can ascertain the characteristics of inflation. Inflation is regarded as general increase in the price of goods and services. It is also important to note that, price increase must be of a basket of goods and services rather than a single or two items, also, the increase in prices must last for a reasonable period of time which must lead to a reduced purchasing power. Therefore, this study took all the definitions above into consideration and viewed inflation as price increases for a basket of goods and services for a reasonable period of time in an economy. Inflation must therefore not be mistakenly defined as a result of the outcome it has on the economy. For instance, people might regard increase on prices of commonly used commodities such as fuel, food and lodging as inflation, this is simply an outcome of inflation effects. Over time, as the cost of goods and services escalate, the money

purchasing power will decline because the same money will buy fewer goods and services as previously could (Dexter, 2005).

3.2. MEASURES OF INFLATION

The inflation rate is widely measured by calculating the movement or change in a price index. The Consumer Price Index (CPI), the Personal Consumption Expenditures Price Index (PCEPI) and the GDP deflator are some examples of broad price indices (Oliver, 2010). The most commonly used index is the CPI. Consumer Price Index (CPI), is defined as the percentage change in the price of a basket of goods and services consumed by households (Oliver, 2010). The inflation rate is then computed from the CPI which is percentage change of a price index over time. The CPI is calculated by collecting prices for couple of items, which are grouped into several categories (or expenditure classes). The information used to calculate the CPI are prices collected from several sources such as retailers, supermarkets, departmental stores, websites where households shop and even government authorities (such as local authorities, municipalities).

The CPI is affected by substitution bias (Hassan, Aboki and Adu, 2014). This is because, very often, CPI does not take into account for household spending patterns changes (identifying such changes for all households is very crucial). In reality, households frequently changed the amounts they spend on items as price changes. In addition, new products are not immediately included in the CPI calculations as soon as they are introduced on the market (Hassan, Aboki and Adu, 2014). It often take some time until they are included in the CPI basket as such product has to reach a reasonable market share to be considered available to most households. Even though most often CPI is used to indicate changes in the cost of living, it is not an ideal measure of this (Kiley, 2008). While the CPI measures price changes and cost of living, inflation is the change in spending by households required to maintain a given standard of living (Kiley, 2008). However, in some instances the Retail Prices Index (RPI) is more preferred than CPI. This is because, RPI is broader than the CPI and contains a larger basket of goods and services. Government authorities may provide other indexes that provide a better indicator on the cost of living, particularly focusing on a specific economic area. Kiley (2008) further argued that, the Reuters-CRB Index (CCI), the Producer Price Index (PPI) and Employment Cost Index (ECI) are good measures of price indices used to narrowly measure price inflation in particular sectors of the economy.

In some economies, PPIs can be used as a substitute for CPI to calculate price inflation. It measures the average changes in prices received by domestic producers for their output (Baker, 2008). This differs

from the CPI because of price subsidisation as profits and taxes may cause the amount received by the producer to differ from what the consumer actually paid. There is also a time lag between an increase in the PPI and any sudden rise in the CPI. PPI measures the burden being put on producers as a result of increase on the costs of raw materials. This costs are then transferred on final product to consumers or absorbed by profits or can be offset by increasing productivity. In India and the United States for instance, an earlier version of the PPI is called the Wholesale price index (Hassan, Aboki and Adu, 2014).

Commodity price indices and core price indices are also used to measure inflation. Commodity price indices measure the price of a selection of commodities which are weighted by the relative importance of the components to the "all in cost" of an employee (Kiley, 2008). Core price indices give a measure of "core inflation", which removes the volatile components (such as food and oil) from a broad price index like the CPI (Kiley, 2008). Due to the fact the core inflation is less affected by short run supply and demand conditions in specific markets, central banks rely on it to better understand the inflationary impact of current monetary policy. Lastly, GDP deflator is also used as a measure of the price of all the goods and services included in gross domestic product (GDP), for example, the US Commerce Department publishes a deflator series for US GDP, defined as it is nominal GDP measure divided by its real GDP measure (Oliver, 2010).

To accurately measure inflation within an economy, it is required that changes in nominal prices on a common set of goods and services are objectively differentiated as well as distinguished from price movements caused by changes in volume, quality or performance. Whenever the price of a product changes over a year period with no alteration in quality, then this difference in price denotes inflation (Barro, 1997). It is also important to note that, inflation model to measures inflation are often revised from time to time. Such a modification can either be changes to reflect new relative weight of goods included in the CPI basket or simply the way in which current goods and services are compared with past goods and services (Baker, 2007). Therefore, this adjustments are necessary to reflect changes in 'typical consumers' buying patterns. This is due to the fact that, new products may oust older ones, quality in the existing goods might changes or consumer preferences just shifted. Thus, over time, the CPI basket and the weighted price used in inflation measures will ultimately changes to keep pace with the evolution in the market (Blanchard, 2001).

3.3. THEORETICAL LITERATURE

Several theories explain the determinants of inflation rate and these are discussed below.

3.3.1. KEYNESIAN THEORY

Keynesian theory is one of the essential theories in economics. According to Keynes' theory, inflation is a short run outcome of demand pressure within the economy. That is, inflation is demand driven rather than influenced by monetary forces. Consumers would demand more goods and services to consume, businesses demand more inputs for investment and the government demands goods and services to meet its social obligations. If the aggregate demand is more than the aggregate supply, inflation would then occur. The higher the gap between the two, the higher the rate of inflation.

It is also further argued that, the money supply growth affected inflation indirectly via interest rate movements rather than through prices. In this observation, money is regarded as a near substitute for various numbers of financial assets. As a result, growth in money supply would lead to surplus demand for financial assets, causing an increase in the prices of financial assets and consequent decrease in the interest rate (Dexter et al, 2005).

3.3.2. MONETARIST THEORY

Another essential determination of inflation is money supply in the economy. When money supply increases in order to increase production and employment, it generates an inflationary pressure in the economy. The focus of monetarists is on money supply and advocate monetary policies as a viable tool to control money supply growth, which would then be transmitted into the control of inflation. Excess supply of money in the economy would lead to domestic inflation. According to Khan et al (2007), money supply is likely to have a major impact on inflation in the long run. In the short run, there seems to be other phenomena, such as food shortages, oil price increases or wage increases, which are significant determining factor of inflation. Money is a near substitute for real assets and financial assets and that any additional cash balances as a result of additional money supply would be spent on those assets instead of being held idle as money balances (friedman 1956 *cited* in Ahmed, Ghauri , Vveinhard, Streimikiene, 2018).

According to the monetarist, the growth of the money supply could be transmitted into inflation either directly or indirectly (Likukela, 2007). The direct transmission arises when the rise in money supply ends up in the hands of suppliers of factors of production, who would ultimately spend it on goods and

services. This type of spending could put too much pressure on the total economic demand. Inflation would then occur due to these demand forces. However, the economic participant might hold their funds with commercial banks and other financial institutions instead of spending on goods and services. This is referred to as an indirect process and inflation would indirectly occur in this case. This is because the funds held with the financial institutions further have the potential to increase the money supply through lending and credit extensions.

On the assumption that central banks exogenously determine money supply, the only solution for mitigating inflation favoured by monetarist is lessening the growth of money supply in the economy. This implies a positive correlation between the quantity of money and the level of inflation. That is, the higher the amount of money in circulation, the higher the rate of inflation in the country. Therefore, the rate at which money supply grows or shrinks would have a significant influence on the speed at which inflation or deflation spread through the economy. According to the monetarist, fiscal policy, government spending and taxation, is ineffective in controlling inflation (Dexter, 2005).

3.3.3. STRUCTURALISTS THEORY

A structuralist is against the view of monetarists. Structuralist argued that the rise in the prices of goods and services over a period of time within an economy is not solely a monetary phenomenon. The structuralists' opinion is that inflation is caused by demand pressures, structural factors such as wage structures, interests rates, interest rate management, supply factors which dictate import bills and cost pressures such as import prices but not the monetary expansion (Canavese, 1982). The model is simplified below:

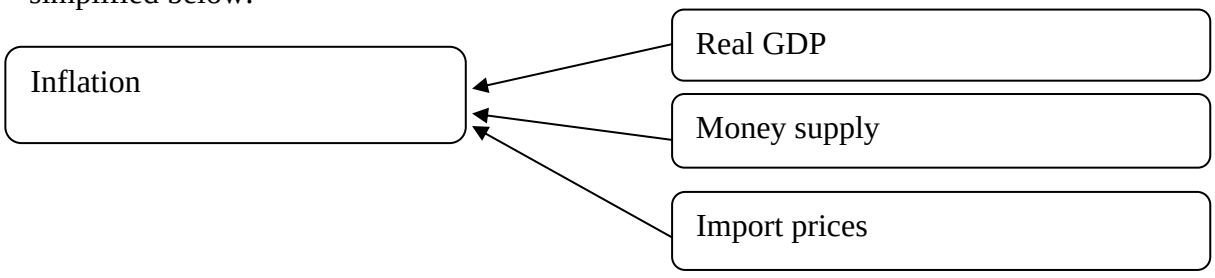

FIGURE 3: STRUCTURALIST THEORY

Structuralists advocate for the use of an already established structure to clarify how fluctuations in the framework and cost lead to a change in prices over time. For instance, if trade unions go on strike to demand higher wages, this would put pressure on their employers to raise wages and salaries. Wages and salaries are one of the critical production cost components. If the wages and salaries rate demanded is greater than the increase in production output, it might lead to an increase in prices. The producers

view the increase in earnings as an escalation in the production cost, and it is transferred to the end users of goods and services. The expectation of relative inelasticity of the supply of food is a structural characteristic that is widely cited. Normally, the interest rate is included in the demand of money to cater for opportunity cost. This is motivated by the fact that the financial market in the emerging economies (including Namibia) is still developing.

Canavese (1982) pointed that, theoretically, the relationship between the derivative of price in relation to money stock and the exchange rate is positive. The assumptions are that money velocity is fixed while the economy is at maximum utilisation. Therefore, given a growth in the quantity of money in an economy, the price level is expected to rise, if continued it would result in inflationary pressure. To describe the positive relationship between fractional derivatives of price in relation to exchange rate, it is observed that increase in price level is due to advancements in exchange rate regimes or as a result of import prices which became more expensive to finance. In the same vein, inflation is assumed to decrease as output increase because an increase in production could calm the demand pressure in the economy.

3.4. INTERNATIONAL TRADE

Since this study focuses on the impact of import on inflation in Namibia, it is therefore fit that the concept of international trade be defined and linked to the concept of inflation. International trade refers to as the transfer of goods and services, which include capital goods from one country to another (Hassan, Aboki and Adu, 2014). This definition concurs with the definition by Economics Concepts (2012) who viewed international trade as trade across international boundaries. Therefore, in the absence of cross border trade, consumer choices will be confined to the goods and services produced within that country. In some instances, international products are more costly than domestically produced. This is because international trade requires other charges or costs such as tariffs as well as other costs associated with country differences such as language, legal system or culture to be added to the product actual price (Hassan, Aboki and Adu, 2014). Most often international trade enjoys comparative advantage resulting from lower input cost abroad, making international trade part and parcel of healthy economy.

3.4.1. THEORETICAL DYNAMICS OF THE RELATIONSHIP BETWEEN IMPORTS AND INFLATION

International trade as discussed above has effect on inflation in open economies. In a closed economic situation, inflation is always as a result of excess demand generated within that economy. But in case of the open economy, inflation is influenced by export and import. Dexter et al. (2005) argued that, imports

directly affect domestic inflation via the prices of imports that are included in the CPI basket. However, the imports can also indirectly alter domestic inflation through the competition of local services and goods with the imported items. Thus, the international trade acts as an open door to trigger pressure within the economy, which pressure may be triggered by the products and services inflows and outflows (Kiley, 2008).

In an open economy, when demand exceeded the domestic production, the country may pursue the import policy in order to respond to this excess demand. In contrast, when local production demand is not in equilibrium with the local production, inflation begins to grind down and surplus production could be exported to other countries to stabilise this situation (Baker, 2007). Therefore, exports and imports are some of the major contributing factors for the inflationary effect in an economy. Mostly, a rise in imports may cause the depreciation in exchange rate, so, increasing the cost of imports could be a viable tool to manage this inflationary pressure (Ali, 2016). Furthermore, if the country depends on imports of raw material to sustain its production, consequently, the local currency depreciates and that makes the imports more costly. Subsequently, local prices of goods will increases because of the increase of raw materials' cost; thus, higher imports has a major impact on inflation (Levi and Nault, 2009). On the other hand, the increase in exports prompt the appreciation of local currency, hence, it tends to decrease the inflation.

Imports and inflation are interlinked, for instance, if a country imports more of its goods either for a mix in the production process or simply for domestic consumptions, the country would be prone to imported inflation. Imported inflation occurs if the price of imported goods increases due to inflation or price hike experienced abroad (Farah and Mortaza, 2009). The domestic prices are therefore expected to increase directly or increase through the cost of production in terms of raw material importation (Cooper, 2012). The classic example is oil prices. If oil prices in the international market suddenly increase, the importer would continue to import oil and have to pay more to acquire the equivalent volume of crude oil. The price increase on imported oil is then transmitted to consumers by paying more. This would also increase the manufacturing and transportation overheads whose effects would be reflected in the prices of domestic goods. In the end, the end users of the production channel are the ones to bear the economic burden due to import price increase. Similarly, one should expect domestic prices to fall due to the fall in prices in the international market (Dornbusch, Fischer & Stanely, 2001).

3.5. EMPIRICAL LITERATURE

Several studies have empirically examined the inflation dynamism particularly, focusing on the impacts of import prices. This section first highlights some empirical studies on the determinants of inflation in Namibia; an area not well-researched. Thereafter, the section reviews studies on other countries.

3.5.1. EMPIRICAL STUDIES IN NAMIBIA

Gaomab II (1998) modeled inflation in Namibia using cointegration analysis, error correction model and structural stability test. The study used annual data from 1973 to 1996. The study revealed that import prices (proxied US prices) and imported inflation from South Africa was very significant in determining Namibia domestic inflation, for example in 1993 was about 9.5%, 1994, 10% and 1995 was at 9.87 %. The above figures have showed a rising trend in inflation and money growth. Broad money supply and growth of money supply were also found to be significant in positively determining inflation in Namibia, both in the long and short run. Real income and interest rates were also found to be significant in the long run. These arguments were corroborated by Likukela (2007) who analysed the determinants of inflation in Namibia using cointegration technique. The study used quarterly data from 1993Q1 to 2003Q4. The results show that in the short run, the level of economic growth and import prices influenced inflation positively. South Africa import prices of goods and services featured more as the major determinant of inflation in Namibia in the short run. As an example from 2005 to 2007 when import value rose from N$15 million to about N$30 million, an increase of 100%, inflation rose from about 2.5% to 6.3%.

In the same vein, Odada and Eita (2010) studied the causes of inflation in Namibia using Augmented Dickey-Fuller unit root and cointegration test. The study was conducted using annual time series from 1972 to 2008. The results showed that money supply (M2) and import prices have a significant positive impact on inflation. Further findings by Ogbokor and Sunde (2011) showed that inflation in Namibia was import price driven. Ogbokor and Sunde used annual microdata from 1990-2007. The empirical analysis was conducted using ordinary least square (OLS). The other variables that were significant in explaining inflation in their study were rate of growth of real GDP, broad money supply (M2), real interest rate and the real exchange rate.

Udji and Kaulihowa (2015) looked at the factors causing inflation in Namibia from 1993 to 2013 using cointegration techniques. The result of the study showed that import prices and government expenditure were major determinants of inflation in Namibia. The relationship was found to be positive and significant.

The study also further postulates that Namibia heavily relies on imports for domestic consumptions. This suggests that Namibia is significantly vulnerable to external price fluctuations (mainly from South Africa).

More recently, Sheefeni and Munepapa (2017) examined the impacts of import prices on inflation in Namibia using quarterly data from the period 1991Q1 to 2013Q4. An error correction model approach was applied on the double log functional form in order to investigate the significance and the effect of explanatory variables on inflation in Namibia. The results for the unit root test showed that all the variables were stationary after the first difference. The residual based test to cointegration shows that there is cointegration among the variables. The error correction model showed that import prices have a significant positive effect on inflation in the long run. While it is also positive in the short run, the effect tends to be insignificant.

3.5.2. EMPIRICAL STUDIES FROM OTHER COUNTRIES

Chien-Liang (1995) estimated a cointegration analysis of inflation in Taiwan. The Maximum likelihood analysis of cointegration was used to define the rank of the cointegrating matrix and investigate the relationship between inflation and its determinants, while Engle and Granger were used to evaluate the short run dynamisms. The results from the analysis showed that in the long run, there exists a stable equilibrium positive relationship between inflation and import prices. Both in the short and long run, import prices were found to contribute significantly to inflation.

Ashra's (2002) empirically studied fifteen developing countries to determine the impact of import prices on inflation. The study analysed data for the year 1980 to 1997. The growth rate of money, agricultural output growth and trade openness (export prices to GDP ratio and import prices to GDP ratio) were found to negatively influence domestic inflation. The impact of import prices on inflation was found to be different among the economies. The coefficient of the small economies was smaller (31.3) relative to the large economies (37.1).

Bowdler and Nielsen (2003) examined inflation adjustment in an open economy. The study analysed the United Kingdom (UK) prices using quarterly data for the period 1969Q1 to 2000Q4. The study found an insignificant positive relationship between import prices and inflation. In this study labour costs were very significant in determining domestic inflation. However, a study by Alfaro (2004) showed that import prices did not play a significant role in controlling inflation in the short run. The study used cross-section analysis

to analyse panel data set for the period 1973-1998 for both developing and developed countries. The study established that the exchange rate had a negative substantial effect on inflation. Classical economists argued that exchange rate reflects the greater accountability, observability and transparency of the exchange rate over openness. Alfaro (2004) demonstrated that, in the short run, the correlation between exchange rate and inflation is substantial. This is because, in the short run, economic cooperation and macroeconomic policies such as fixed exchange rate regime could control inflation dynamics.

Corrigan (2005) examined the relationship between import prices and inflation in the United States using a variant of Rich – Rissmiller and Gordon formulations. The study used quarterly data series from 1986 Q1 to 2004 Q4 for three different prices (Consumer Price Index, Producer Price Index and Import price). The analysis tested three different relationships namely; the relationship between a measure of economy-wide inflation to import prices, a measure of demand excesses in the economy in relation to inflation and inertia factor in relation to inflation. The study concluded that import prices significantly and positively contributed to domestic inflation during the period under consideration.

According to Peacock and Baumann (2008), import prices could be useful to explain movement in domestic inflation. The study used New Keynesian Philips Curve (NKPC) to model the effects of the open economy, through intermediate import prices in firm's production technology, on inflation dynamics in three developed countries namely, USA, UK and Japan. The vector autoregression methodology was adopted to explore the cross-equation restrictions that the theory has on the coefficient of the VAR under rational expectations. The overall results suggested that, based on the quarterly data 1965Q2 – 2007Q1 used, import prices is a determinant in explaining inflation movement. This is due to the fact that NKPC models allow for import prices to enter into firm's costs which outperform closed economy models. The relationship was found to be positive and slightly insignificant.

Farvaque and Sarfaraz (2009) hypothesised that, inflation and openness relationship varies in Asian developing countries and developed OECD countries. The method adopted was Hodrick and Prescott filter method, and International Monetary Fund (IMF) defined methodology (the sum of export and import prices relative to GDP). Their study is centered on the annual data for 1980 to 2006. The study considered thirty-seven countries where twenty-one are industrialised countries and sixteen are Asian developing countries. The variables considered were inflation rate based on CPI as the dependent variable and import prices, export prices, real GDP and trade as a percentage of GDP (a measure of trade openness) as independent

variables. The results revealed a negative relationship between inflation and import prices for both groups of countries included in the study.

Ulke and Ergun (2011) investigated the relationship between inflation rate (CPI) and import volume in Turkey using monthly time series data over the period 1995-2010. The study used vector error correction model (VECM) approach to analyse data. The results show that there is long-term and short-term co-integrating relation between inflation and import volume. The study further found a one-way granger-causality from import to inflation. On the other hand, Kalin and Abdullah (2012) empirically analysed the food prices inflation in Pakistan using annual data from 1972 to 2008. The Johansen's co-integration technique was utilised to find the long run relationships among food price inflation and its determinants. The explanatory variables used are inflation expectations, money supply, per capita GDP, support prices, food import and food export prices. The findings of the study showed the long run relationships among food price inflation and its determinants. In the long run, all the variables included in the model affected food inflation positively and significantly. The exception was attributed to money supply, which is insignificant with expected positive sign. In the short run, only inflation expectations, support prices and food exports affect the food price inflation. The results further reveal that both demand and supply side factors are the determinants of food price inflation in Pakistan.

Ramzan, Fatima and Yousaf (2013) analysed the relationship between inflation and trade openness in Pakistan. Annual data series from 1971 to 2009 was used in the study. The study used autoregressive model to analyse data. The model captured inflation as the dependent variable with openness to trade (proxied: import and export prices), broad money supply (M2) and GDP as independent variables. The results from the study depicted that there is a significant positive relationship between inflation and import prices. However, Ndidi (2013) investigated the determinants of inflation in Nigeria using annual data from 1970 to 2010 using OLS estimation technique within ECM framework to obtain the short and long run relationships and establish the long run equilibrium. The variables included in the model were GDP, money supply, exchange rate, inflation expectation and trade openness: export and import prices. The study showed that money supply and expected inflation significantly determine inflation. The import prices were found to have an insignificant negative impact on inflation. This implies that purchase of goods and services from outside the country's border do not contribute to the domestic inflation.

In Yemen, Almounsor (2015) analysed the inflation dynamics for the period 1995Q1 to 2007Q4. The techniques used were: single equation model, a structural vector auto-regression model, and vector error

correction model (VECM). The findings showed that inflation dynamics in Yemen are driven by international price shocks. Ofori, Richardson and Asuamah (2015) modelled the link between inflation and import volume in Ghana using the Autoregressive Distributed Lag Model (ARDL) method with annual data series for the period 1960 – 2012. The results show an insignificant negative relationship between import volume and inflation in the long run. This negative relationship was significant in the short run. Akinboade, Siebrits & Niedermeier (2004) studied the determinants of inflation in South Africa using quarterly secondary data series from 1970Q1 to 2000Q2 and a general VAR model. The variables included in the model were broad money supply (M3), nominal interest rate, nominal effective exchange rate, unit labour cost and change in import cost. The study found that inflation in South Africa is a structural phenomenon rather than imports driven.

TABLE 1: **SUMMARY OF LITERATURE REVIEW**

Articles	Countries	Periods	Econometric Techniques used	Variables Used	Findings
Chien-Liang (1995)	Taiwan	1952 - 1984	Maximum likelihood analysis of cointegration and Engle & Granger	Import prices, Money supply, Real GDP and inflation rate.	The result from the analysis suggested that in the long run, there exists the stable equilibrium relationship between inflation and import prices. Both in the short and long run, import prices were found to be a significant explanatory variable of the inflation.
Gaomab II (1998)	Namibia	1973-1996	Cointegration, ECM and structural stability test.	Foreign prices (US), SA inflation rate, Broad money supply (M2), growth of money supply, real income and interest rate.	The study revealed that import prices (proxied US prices) and imported inflation from South Africa is very significant in determining Namibia's domestic inflation.
Alfaro (2004)	Developed and developing countries	1973 - 1998	Cross section analysis	The inflation rate, Import prices, Export prices, GDP per capita, Fiscal deficit, Exchange rate and	The study showed that trade openness did not play a significant role in controlling inflation. The significant role was attributed to the exchange rate.

				Government debt.	
Ashra's (2002)	15 Developing countries	1999 - 2001	Panel data model	Money growth rate, agricultural output growth and trade openness (proxied export and import prices).	The impact of import prices on inflation was found to be different among the economies.
Bowdler Nielsen and (2003)	UK	1969Q1 - 2004Q4	Co-integrated Vector Auto-regression model (VAR).	Consumer prices, unit labour costs, import prices and real consumption growth.	High real import prices have significant impacts on inflation in the absence of wage accommodation effects.
Corrigan (2005)	US	1986Q1 - 2004Q4	Rich – Rissmiller and Gordon formulations	CPI, PPI & Import prices	Import prices significantly explain domestic inflation.
Likukela (2007)	Namibia	1993Q1 - 2003Q4	Cointegration (Augmented Dickey-Fuller (ADF) unit root test)	Real GDP, Broad money supply, interest rate, Import prices (proxies: CPI: SA & CPI: US)	The level of economic growth and import prices, mainly from South Africa, influences domestic prices.

Peacock & Baumann (2008)	US, UK & Japan	1965Q2 - 2007Q1	New Keynesian Philips Curve (NKPC)	The inflation rate, Labour cost, Import prices and GDP	The study found that import prices could be useful to explain movement in the domestic inflation.
Farvaque & Sarfaraz (2009)	Asian developing countries and developed OECD countries	1980-2006	Hodrick & Prescott filter method and IMF defined methodology (the sum of exports and imports relative to GDP).	CPI, Real GDP, Import prices, Export prices and trade openness	The study showed a negative relationship between inflation and trade openness, through the export prices.
Odada & Eita (2010)	Namibia	1972Q1 - 2008Q4	Augmented Dickey-Fuller unit root and cointegration test	M2, Import prices, CPI, real GDP	M2 and import prices have a significant positive impact on inflation.
Ogbokor and Sunde (2011)	Namibia	1990 - 2007	Ordinary Least Square (OLS)	Import prices, the rate of growth of GDP, M2, real interest rate, real exchange rate and inflation rate.	Inflation in Namibia is import price driven.

Kalin and Abdullah (2012)	Pakistan	1972-2008	Johansen's co-integration technique	Food import prices, Food export prices, per capita GDP, Inflation expectations, Money supply.	All the determinants affected food price inflation positively and significantly except money supply which is insignificant with an expected positive sign. In the short run, only inflation expectations, support prices and food exports affect the food price inflation. Both demand and supply side factors determine food price inflation in Pakistan.
Ndidi (2013)	Nigeria	1970 – 2010	OLS	GDP, money supply, exchange rate, inflation expectation and trade openness (proxied import and export prices.	Import prices have a significant negative impact on inflation.
Ramzan et al (2013)	Pakistan	1971-2009	Vector Autoregression Model.	M2, Inflation rate, GDP and Trade openness.	The results from the study showed that there is a positive significant relationship between inflation and trade openness.
Almounsor (2015)	Yemen	1995: Q1-2007Q4	Single equation model, Structural, Vector Autoregression Model, Vector and Error Correction Model.	Import prices, export prices, exchange rate, inflation rate and money supply.	The outcomes suggested that inflation dynamics in Yemen are driven by international price shocks, exchange rate depreciation, domestic demand shocks, and monetary innovations.
Ofori et al (2015)	Ghana	1960-2012	Autoregressive Distributed Lag Model (ARDL)	Inflation rate Import volumes and Government expenditure	The insignificant negative relationship between import volumes and inflation rate in the long run but significant in the short run.
Udji & Kaulihowa (2015)	Namibia	1993-2013	Cointegration	M2, import prices, government expenditure and GDP.	The result of the study showed that government expenditure and import prices are determinants of inflation in Namibia. The relationship was

					found to be positive and significant.
Munepapa Sheefeni & (2017)	Namibia	1991Q1 - 2013Q4	Error Correction Model	Inflation rate, broad money supply, Lending rate, import price index, GDP and exchange rate	Import prices have a significant positive effect on inflation in the long run, while in the short run the effect is insignificant.

LITERATURE GAP

Based on the review of the previous studies, firstly, different conclusions were reached on the impact of import prices on inflation. The results ranged from positive through nominal or insignificant to no relationship at all. It is also important to note that some studies have used import volumes in the absence of import prices. Secondly, several techniques were employed, which include simple regressions, ordinary least squares, two-stage least squares, VAR and ECM. Several studies reviewed found a significant positive impact of import prices on inflation in the long run whereas, studies by Ofori et al. (2015), and Farvaque and Sarfaraz (2009) found the relationship to be negative. Almounsor (2015) found no relationship between import prices and inflation in their studies. There are few studies on the inflation-import nexus in Namibia; Sheefeni and Munepapa (2017), Udji and Kaulihowa (2015), Ogbokor and Sunde (2011), Likukela (2007) and Gaomab II (1998). However, the current study differs from previous studies in terms of variables used, updated data and econometric techniques used. Additionally, the rebased consumer price index (CPI) and the ordinary least square within VAR framework were adopted.

3.6. CONCLUSION

Based on the theoretical review and empirical evidence above, the main attributes to inflation rate dynamics are interest rate, exchange rate, import prices of goods and services (both import prices as a mix in the production process and for household consumptions) and growth rate of real GDP. This study draws from this conclusion and proceeds to evaluate the impacts of import prices on inflation rate, as Namibia is a net importer of most of the commodities consumed by the nation. The next chapter highlights the methodology adopted in this study.

CHAPTER FOUR: DATA AND METHODOLOGY

This chapter presents the research methodology adopted in this study. The chapter has four sections. Section 4.1 presents the model specification, section 4.2 describes the variables and data sources, and finally, section 4.3 presents the estimation techniques.

4.1. MODEL SPECIFICATION

Based on the empirical literature, this study adopted a model by Almounsor (2015), to analyse the impact of imports on inflation in Namibia. This is because it is in line with the econometric technique used with the objective to observe the direction of causality, examine the impact and shock of import prices on inflation. The relationship is analysed through a vector autoregression (VAR) approach which is a system of dynamic linear equations where all the variables in the system are treated as endogenous. The relationship is described as a dynamic system whose standard form equation is given by:

$$INFL_t = \Theta_0 + \sum_{i=1}^{p} (LNIMP, LNGDP, LNM2)\, \Theta_i INFL_{t-1} + \varepsilon_t \quad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (4.1)$$

Where:

$INFL_t$	= Inflation rate at time t
Θ	= matrix of constant term
LNIMP	= natural logarithm of import price index proxied by import value index
LNGDP	= natural logarithm of real gross domestic product
LNM2	= natural logarithm of broad money supply
Θ_i	= matrix of coefficients of lagged dependent variable
$INFL_{t-1}$	= vector of the lagged dependent variable (inflation rate)
ε_t	= vector of the error term

The study examined the role of import prices in determining domestic prices in Namibia. It is therefore important to highlight the expected signs of the relationship between inflation and import prices as well as the control variables included in the model. The relationship between inflation and import prices is expected to be positive. This is due to the fact that theoretically, imported inflation occurs if the price of imports becomes relatively expensive due to price adjustments in the foreign country as a result of inflation in that country. In the same vein, the prices of local goods using the imported goods or as a mix in the production chain would also increase and vice versa.

Similarly, the relationship between inflation and money supply is expected to be positive. This is because economic theory stipulates that excessive money supply within an economy would induce inflation either through large demand of goods exceeding production or via production input cost. Moreover, the theory states that there is a positive relationship between inflation and real GDP. This is because; an increase in the real GDP would increase the aggregate demand.

4.2. VARIABLE DESCRIPTION AND DATA SOURCES

The variables used in this study include the structuralist, demand side and monetarist variables that determine inflation rate. These are: import price index proxied by import value index, real gross domestic product and broad money supply respectively. The variable inflation rate is INFL, which is described as a percentage increase in general prices of goods or services in a country over a period of time. The variable import price index is LNIMP, which is described as natural logarithm of average prices of foreign goods bought by Namibian residents, the government or any entity residing in the country. The variable real gross domestic product, LNGDP, is the natural logarithm of market value of all final goods and services emanated from Namibia over a certain period. The variable money supply is the broad money supply (LNM2); it is the natural logarithm of the amount of money and momentary assets in the economy. LNM2 includes the components of near money (M1, the assets that are highly liquid such as demand deposits and currency).

This study employed quarterly data spanning over the period 1998: Q2 to 2017: Q4, making 79 observations. The secondary data were sourced from the Bank of Namibia (BoN) database, Namibia Statistics Agency (NSA) trade statistics database and World Bank (World Development Indicators) database.

4.3. ESTIMATION TECHNIQUES

4.3.1. VECTOR AUTOREGRESSION

This study used the vector autoregression (VAR) technique in analysing the relationship between inflation rate and import prices along with other control variables. The choice of this technique stemmed from the fact that the VAR technique is the most useful tool in illustrating the interrelationship among variables. The VAR is a system of dyna-mic linear equations under which all variables enter the system as endogenous. It can be expressed in a compact form as follow:

$$AINFL_t = \Psi + \Omega(L)\mathrm{INFL}_{t-i} + B\mu_t \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (4.2)$$

Where: A is an invertible $(n \times n)$ matrix describing contemporaneous relations among the variables; INF_t is an $(n \times 1)$ vector of endogenous variables such that; $INFL_t = (INFL_{1t}, INF_{2t}, \ldots, INFL_{nt})$; Ψ is a vector of constants; Ω_i is an $(n \times n)$ matrix of coefficients of lagged endogenous variables ($\forall_i =$ $1,2,3, \ldots, p$); B is an $(n \times n)$ matrix whose non-zero off-diagonal elements allow for direct effects of some shocks on more than one endogenous variable in the system and μ_t are uncorrelated or orthogonal white-noise structural disturbances.

It follows that from equation (4.1), a reduced form of the system gives one equation for each variable, where that variable is specified as a function of the lagged values of its own and all other variables in the system. The reduced-form VAR time series model could be estimated by ordinary least squares (Thomas, 1997). In this study, the relationship is specified as:

$$INFL_t = f(LNIMP_t, LNGDP_t, LNM2_t) \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (4.3)$$

The multivariate linear simultaneous VAR system for inflation rate is:

$$INFL_t = \alpha_0 + \sum_{i=1}^{k} b_{11}\, INFL_{t-i} + \sum_{i=1}^{k} b_{12}\, LNIMP_{t-i} + \sum_{i=1}^{k} b_{13}\, LNGDP_{t-i} + \sum_{i=1}^{k} b_{14}\, LNM2_{t-i} + \varepsilon_t^{INFL} \ldots\ldots\ldots\ldots 4.4a$$

$$LNIMP_t = \alpha_0 + \sum_{i=1}^{k} b_{21}\, INFL_{t-i} + \sum_{i=1}^{k} b_{22}\, LNIMP_{t-i} + \sum_{i=1}^{k} b_{23}\, LNGDP_{t-i} + \sum_{i=1}^{k} b_{24}\, LNM2_{t-i} + \varepsilon_t^{LNIMP} \ldots\ldots\ldots..4.4b$$

$$LNGDP_t = \alpha_0 + \sum_{i=i}^{k} b_{31}\, INFL_{t-i} + \sum_{i=1}^{k} b_{32}\, LNIMP_{t-i} + \sum_{i=i}^{k} b_{33}\, LNGDP_{t-i} + \sum_{i=1}^{k} b_{34}\, LNM2_{t-i} + \varepsilon_t^{LNGDP} \ldots\ldots\ldots 4.4c$$

$$LNM2_t = \alpha_0 + \sum_{i=1}^{k} b_{41}\, INFL_{t-i} + \sum_{i=1}^{k} b_{42}\, LNIMP_{t-i} + \sum_{i=1}^{k} b_{43}\, LNGDP_{t-i} + \sum_{i=1}^{k} b_{44}\, LNM2_{t-i} + \varepsilon_t^{LNM2} \ldots\ldots\ldots\ldots 4.4d$$

Where: ε_t^{INFL}, ε_t^{LNIMP} , ε_t^{LNGDP} and ε_t^{LNM2} are the white noise error terms and independent of the dependent variables to capture the unexpected shocks.

The above structural VAR model is derived from the economic theory. The four model equations illustrated above have lag length k-th, VAR (k), which is the longest lag length. For instance, equation 4.4a explains that current INFL is explained by lagged INFL, LNIMP, LNGDP and LNM2. An additional aspect to the VAR modelling is the basic requirement of stability of the VAR model. A steady process is one that would not diverge to infinity ("blow up"). Particularly, a VAR process is considered stable if the reverse characteristic polynomial has no roots outside of the unit circle, meaning the root strictly lies between 1 and -1 (Lütkepohl, 2007). Thus, an essential fact is that stability implies stationarity of the VAR. Hence, it is important to test for stability to ensure that a VAR process is in order.

Given the estimates of the reduced form- VAR in equation (4.1), the structural economic shocks are separated from the estimated reduced form residuals by imposing restrictions on the parameters of matrices A and B in equation (4.5).

$$A\varepsilon_t = B\mu_t \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (4.5)$$

However, prior to imposing restrictions on the parameters, various tests should be conducted. The restrictions ensure the stability of the VAR model such that the eigenvalues of the matrix are between 1 and -1. These are discussed below.

4.3.2. TESTING FOR STATIONARITY

The estimation began with testing for stationarity of the variables in the time series. This is because most economic variables exhibit trends, which are problematic as they influence the results thereof. Specifically, variables containing unit root could not be estimated using the ordinary least square (OLS) method due to a problem of spurious regression. The regression results could show a relationship among variables that have no relationships. Furthermore, this test also enables the determination of the order of integration, which could be zero I (0), one I (1) or higher order I (n) (Gujarati, 2003: 814). Therefore, the Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP) tests were used to test for the stationarity. The null hypothesis, H_0, is that the series contain unit root, implying nonstationary. The

alternative hypothesis, H_1, is that the series are stationary meaning they do not contain unit root. The null hypothesis is rejected if the calculated value of the ADF or PP is greater than one of the critical values at a given level of significance. The null hypothesis is rejected if the calculated value of the ADF or PP is less than any of the critical values. These values are interpreted in absolute values. If the series are found to be non-stationary in levels, then they have to be differenced until they become stationary in order to correct for unit root.

4.3.3. OPTIMAL LAG LENGTH DETERMINATION

The determination of the optimal lag length is of greater importance. This is due to the fact that any model that involves lagged variables is sensitive to the number of lags included in the regression. Thus, the optimal lag length has to be determined as it affects the VAR model. Many criteria are used to indicate optimal lags namely, Hannan-Quinn (HQ), Schwarz information criterion (SC), Akaike information criterion (AIC), Final prediction error (FPE) and Likelihood ratio (LR). In this study, both the Akaike (AIC) and Schwarz Information Criteria were used in order to find the optimal lags as these two criteria have been adopted in many studies (Foresti, 2006). For a VAR model, if the lag length is too small, then the remaining serial correlation in the errors would bias the test. On the other hand, if it is too large, then the power of the test would suffer (Gujarati, 2003: 824). Estimates of a VAR whose lag length differs from the true lag length would be uneven as well as the impulse response functions and variance decomposition derived from the estimated VAR. Lütkepohl (2007) indicated that overfitting (selecting a higher order lag length than the true lag length), causes an increase in the mean-square- forecast errors of the VAR and that under fitting the lag length often causes auto correlated errors. The accuracy of forecasts from VAR models varies substantially for alternative lag lengths (Hafer & Sheehan, 1989).

4.3.4. CO-INTERGRATION AND VECM

If at least two variables become stationary after the first difference, then the cointegration test has to be applied. Thus, the test for cointegration is to check if two or more series have long-run equilibrium. This is more pertinent especially if the variables involved are integrated of order one I (1) or higher (Gujarati, 2003: 297). The cointegration test could be applied in several ways, according to the nature of the equation that is tested. In this case, the Johansen cointegration test is the most appropriate because this modelling approach entails a multivariate system. Specifically, cointegration provides information about the existence of long run equilibrium relationship among the nonstationary variables. The Johansen cointegration helps in determining the number of cointegrated vectors in a model based on two statistics,

the maximal eigenvalue and the trace statistic.

The null hypothesis is that there is no cointegration while the alternative is that there is cointegration. Rejection of the null hypothesis is done when the calculated test statistic value is greater than at least one critical value. We reject the null hypothesis when the test statistic value is less than at least one critical value. In a situation where the two tests present conflicting results, the maximum eigenvalue would be chosen over the trace statistic. This is because this statistic has a sharper alternative hypothesis and usually pins down the exact number of cointegrating vectors (Akanbi, 2012). Enders (2004:354) also pointed out the selection of maximum eigenvalue over trace statistic during conflicting results because in general, the *t*-statistics coefficients do not have an asymptotic *t*-distribution. The absence of asymptotic *t*-distribution is a situation where variables could be cointegrated but the variable sequence is serially correlated.

It follows that, if there is no co-integration, all the analysis would be estimated using the VAR results. It is important to note that, a VAR could only be used on stationary variables. If variables are I (1) and there is no cointegration among the variables, the variables that are I (1) have to be differenced once; before including them in the model along with the variables that are I (0) in order to estimate a VAR. The study then used the VAR results to carry out Granger causality tests, impulse response functions and variance decomposition analysis. If co-integration is found among the variables, the vector error correction model (VECM) was adapted to adjust the short-run to the long run equilibrium. In this case, all these tests were done using the VECM model.

4.3.5. GRANGER CAUSALITY ANALYSIS

Granger causality is a statistical concept of causality that is based on prediction. According to Granger causality, if a variable X_1 "Granger-causes" another X_2, then past values of X_1 should contain information that helps predict X_2 above and beyond the information contained in past values of X_2. That is, the dependency or connectivity between the variables could either be unidirectional or bidirectional. The null hypothesis states that; X_1 values at time *t* does not granger cause X_2 values at time *t* while alternative hypothesis is that, X_1 values at time t does granger cause X_2 values at time *t*. The null hypothesis is not rejected if the calculated test statistic value is less than at at least one critical value and rejected when the test statistic value is greater than at least one of the critical value.

4.3.6. IMPULSE RESPONSE FUNCTIONS

In empirical applications, the primary use of the VAR is to derive the impulse response function which traces the reaction of the endogenous variables to one standard deviation shock as a result of disturbance term in the system. Therefore, a shock to a variable is transmitted to all of the endogenous variables through the dynamic structure of the VAR (Sheefeni, 2013). Therefore, an impulse response function shows the interaction between or among the sequence of endogenous variables.

Generally, the impulse response functions have the same general causal sequence. This is on the basis that all the variables in the multi-equation system share similar types of dynamics. Thus, if the system is stable, the impulse responses would all approach zero, though there would be a difference in the timing of the effects. Therefore, the assumption is that, the VAR error returns to zero in the subsequent periods and all other errors equal to zero (Sheefeni, 2013). It is worth noting that the study used the generalised impulse response function to avoid the sensitivity resulting from the ordering of the variables.

4.3.7. FORECAST ERROR DECOMPOSITION

The forecast error variance decomposition (FEVD) is derived from VAR. The FEVD examines the effects of shocks to the dependent variables. It determines how much of the forecast error variance for any variable in a system is explained by innovations to each explanatory variable over a certain time series horizon (Stock & Watson, 2001). Normally the own series shocks explain most of the forecast error variance, although the shock also affects other variables in the system. In addition, the ordering of the variables also plays a significant role when conducting these tests. This is because in practice the error terms of the equations in the VAR would be correlated, so the result will be dependent on the order in which the equations are estimated in the model. However, since the generalised impulse definition is utilised, the sensitivity towards the ordering of the variables would not be a problem.

4.3.8. DIAGNOSTIC TESTS

Three tests had to be satisfied in order to establish the reliability, stability and validity of the results obtained. These are:

Normality test: the study used Jarque-Bera statistics to determine the distribution of the model. The null hypothesis of this test denotes that the model is normally distributed whilst, the alternative denotes that the model is not normally distributed. The null hypothesis would not be accepted if Jarque-Bera statistics

is greater than the significant level and not rejected if Jarque-Bera statistics is less than the significant level.

Serial Correlation LM test: this test was used to examine the residuals for serial correlation and to determine if the residuals are independent. This test hypothesised that the model does not suffer from autocorrelation while the alternative states that the model suffers from autocorrelation. The study failed to accept the null hypothesis if calculated Breusch-Godfrey Serial Correlation is less than the significant level and not rejected if the calculated Breusch-Godfrey Serial Correlation is greater than the significant level.

Heteroskedasticity test: One of the classical linear regression model assumptions stipulates that the model should have a constant variance to be deemed as a good model. If there is non-constancy in the variance of the errors, then there is a problem of heteroscedasticity (unequal spread of variance). Thus, heteroscedasticity is used to test whether or not the variance of residual is constant. Using the ARCH test, the null hypothesis denoted that the model is homoscedastic while the alternative hypothesis stated that the model is heteroscedastic. The null hypothesis would be rejected if calculated ARCH test is less than the significant level and not rejected if the calculated ARCH test is more than the significant level.

CHAPTER FIVE: EMPIRICAL FINDINGS AND ANALYSIS

This chapter presents empirical findings of this study. The chapter is divided into two sections namely, section 5.1, which presents the empirical findings and; section 5.2, which summaries the chapter.

5.1. EMPIRICAL FINDINGS

The empirical analysis commenced with observations of the stationarity trend of the four variables used in the study (see Appendix A of trend diagrams of the variables).The results have showed that, natural log of real GDP is continuously trending upwards while natural log of broad money growth trends upwards between 1998 and 2006 and the downwards after 2006. In addition, natural log of import prices trend downwards between 1998 and 2014 after which it moved upwards. Lastly, the inflation rate showed no clear trend throughout the entire period. The fact that all the variables have trends implies that they might be non-stationary in levels. This implies that they might need to be differenced before they become stationary. Thus, the Augmented-Dickey-Fuller (ADF) and the Phillips Perron (PP) unit root test methods are employed to formally test for stationarity of the variables.

5.1.1. TESTING FOR STATIONARITY

Table 2 displays the results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests.

TABLE 2: UNIT ROOT TESTS: ADF AND PP ADF AND PP IN LEVELS AND FIRST DIFFERENCE

Variable	Model Specification	ADF Levels	PP Levels	ADF First Difference	PP First Difference	Order of Integration
INFL	Intercept	-2.383	-2.254	-2.992**	-5.876***	I(1)
	Intercept and Trend	-3.048	-2.373	-2.978	-5.852***	I(1)
LNIMP	Intercept	-2.332	-1.684	-4.424***	-3.161*	I(1)
	Intercept and Trend	-2.152	-1.120	-5.643***	-3.367*	I(1)
LNGDP	Intercept	0.226	0.471	-4.454***	-4.765***	I(1)
	Intercept and Trend	-2.238	-1.234	-5.723***	-4.468***	I(1)
LNM2	Intercept	-1.876	-2.156	-4.769***	-4.432***	I(1)
	Intercept and Trend	-2.597	-2.670	-5.224***	-6.229***	I(1)

Test critical values: ADF [1% -4.10; 5% -2.90; 10% -2.59]; PP [1% -4.08; 5% -3.47; 10% -3.16].
*Notes: *, ** and*** mean the rejection of the null hypothesis at 10%, 5% and 1%, respectively.*
Source: author's compilation using Eviews

Using the 'intercept' and 'intercept and trend' specifications, the results shows that all the variables are non-stationary at all levels of significance. However, they all became stationary after being differenced once, which implies that they are all integrated of order one (1)]. These results tend to confirm the informal results (Table A1).

5.1.2. DETERMINATION OF OPTIMAL LAG LENGTH

The next step was to determine the lag length. Table 3 displays the different lag length suggested by the different criterion. However, this study used the Akaike information criterion (AIC) and Schwarz information criterion (SC) as it is a standard in most empirical studies. Both AIC and SC suggest an optimal lag length of two, thus this study chose to follow suite.

TABLE 3: OPTIMAL LAG LENGTH

Lag	LogL	LR	FPE	AIC	SC	HQ
0	863.7006	NA	1.76e-15	-22.62370	-22.50103	-22.57467
1	1489.097	1168.503	1.91e-22	-38.66044	-38.04708	-38.41531
2	1601.738	198.6047*	1.50e-23*	-41.20363*	-40.09960*	-40.76241*
3	1610.217	14.05726	1.85e-23	-41.00571	-39.41100	-40.36839
4	1612.577	3.663712	2.70e-23	-40.64675	-38.56136	-39.81333

** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
Source: Author's compilation using E-views

The study also conducted pre-tests that allow continuing using the VAR method if VAR conditions are satisfied. The two tests that must be conducted as pre-tests are the characteristic roots polynomial and the autocorrelation tests. The characteristics roots polynomial test must show that the parameters in the VAR model are stable. In addition, the correlation test must show no autocorrelation. At the chosen lag

length, all of the inverse roots of the characteristic VAR polynomial have a modulus of less than two and lie inside the unit circle, which implies that the parameters in the VAR model are stable as shown in Table B1 in the appendix. Furthermore, there is also no autocorrelation at the chosen lag length as shown in Table B2 in the appendix.

5.1.3. TESTING FOR CO-INTEGRATION

The Johansen cointegration test was used to test the possible existence of any long-run relationship since all the variables were integrated of order one I (1). Table 4 shows the results of the Johansen cointegration test based on the Trace and Maximum Eigen values of the stochastic matrix. The results revealed that there is no cointegration in using both the Trace and the Maximum Eigenvalue tests at the 5% level of significance. These results imply that the VAR estimation must be utilised in order to do Granger causality tests, impulse response functions and variance decomposition.

TABLE 4: JOHANSEN COINTEGRATION TEST

Maximum Eigen Test				**Trace Test**			
H_0: rank = r	H_1: rank = r	Statistic	0.05% Critical value	H_0: rank = r	H_1: rank = r	Statistic	0.05% Critical value
r=0	r=1	47.05891	47.85613	r=0	r=1	21.42729	27.58434
r≤1	r=2	25.63162	29.79707	r≤1	r=2	16.90983	21.13162
r≤2	r=3	8.721787	15.49471	r≤2	r=3	7.351243	14.26460
r≤3	r=4	1.370544	3.841466	r≤3	r=4	1.370544	3.841466

Source: Author's compilation

5.1.4. VECTOR AUTOREGRESSION MODEL

Given that there is no cointegration among the variables, the study proceeded to use the VAR results to carry out Granger causality tests, impulse response functions and forecast error variance decomposition. Since the VAR results have no economic meaning, they are left out of the analysis, but they are reported in Table B3 in the appendix.

5.1.5. GRANGER CAUSALITY ANALYSIS

It should be noted that the main purpose of the study was to establish the impact of import prices on inflation in Namibia. All the other variables that were included are used as control variables. This, therefore, means that the study focused on the granger causality results where the inflation rate is the dependent variable. The H_0 is that; import prices at time *t* does not granger cause inflation at time *t* while the H_1 is that, import prices at time t does granger causes inflation at time *t*. The H_0 is not rejected if the test statistic value is less than at least one critical value. According to these results (Table 5), import prices granger-cause inflation at the 1% level of significance. This implies that there is a possibility that Namibia imports inflation from other countries in the short run, particularly from South Africa where Namibia gets about 80% of it is imports. Also, inflation is found to be granger caused by real GDP but M2 does not granger causes inflation rate in Namibia.

TABLE 5: VAR GRANGER CAUSALITY/BLOCK EXOGENEITY WALD TESTS

DEPENDENT VARIABLE : INFL			
excluded	.chi-sq	df	prob
LNGDP	4.5514582	1	0.0212
LNM2	1.471244	1	0.2251
LNIMP	6.888457	1	0.0024
All	4.564005	3	0.2067
DEPENDENT VARIABLE :LNGDP			
excluded	Chi-sq	df	prob
LNGDP	1.827628	1	0.1764
LNM2	5.321781	1	0.0211
LNIMP	0.426760	1	0.5136
All	0.077469	3	0.1079
DEPENDENT VARIABLE : LNM2			
excluded	Chi-sq	df	prob
LNGDP	10.71561	1	0.0011
LNM2	3.421987	1	0.0643
LNIMP	3.940720	1	0.0471
All	59.38096	3	0.000
DEPENDENT VARIABLE : LNIMP			
excluded	Chi-sq	df	prob
LNGDP	0.042267	1	0.8371
LNM2	0.008476	1	0.9266
LNIMP	0.980686	1	0.3220
All	0.992591	3	0.8030

Source: Author's compilation using E-views

5.1.6. FORECAST ERROR VARIANCE DECOMPOSITION

Table 6 shows the variance decomposition results for all the variables. In this table, we are interested in the variance decomposition of inflation (INFL); which is presented over 10 quarters, making 2 and a half years.

TABLE 6: FORECAST ERROR VARIANCE DECOMPOSITION RESULTS

Variance Decomposition of INFL:					
Period	S.E.	LNGDP	LNM2	LNIMP	INFL
1	0.32946	12.1313	0.1725	12.7844	74.9118
2	0.34336	11.2953	4.16699	12.6201	71.9177
9	0.35585	14.363	6.45307	11.8219	67.362
10	0.35752	14.2637	7.2439	11.75	66.7424
Variance Decomposition of LNGDP:					
Period	S.E.	LNGDP	LNM2	LNIMP	INFL
1	0.00429	100	0	0	0
2	0.00598	86.2204	0.0126	12.6612	1.10586
9	0.01705	14.2265	3.83729	80.5134	1.42289
10	0.01843	12.4201	4.22772	81.7559	1.59633
Variance Decomposition of LNM2:					
Period	S.E.	LNGDP	LNM2	LNIMP	INFL
1	0.00842	41.6082	58.3918	0	0
2	0.01201	24.876	56.888	8.44013	9.79592
9	0.01809	31.944	37.1693	25.7731	5.11367
10	0.01955	28.3551	32.7742	34.341	4.5297
Variance Decomposition of LNIMP:					
Period	S.E.	LNGDP	LNM2	LNIMP	INFL
1	0.03729	0.00799	6.3863	93.6057	0
2	0.05313	0.28052	8.91676	88.3634	2.43929
9	0.1177	0.70456	8.5715	87.9318	2.79219
10	0.12437	0.78518	8.52117	87.8819	2.81174
Cholesky Ordering: LNGDP LNM2 LNIMP INFL					

Source: Author's compilation using E-views

The results show that in the first quarter, about 75% of the variation in inflation is explained by shocks to inflation and in the 10th quarter (which is the highest period considered in the study) about 67% of the variation in inflation is explained by shocks to inflation. It should also be noted that about 13% of the variation in inflation is explained by shocks to import prices in the first quarter. This variation of inflation falls slightly in the tenth quarter to about 12%. This implies that the variation in inflation as a result of shocks in import prices become less severe over time.

Furthermore, GDP shocks explain about 12% of the variation in inflation in the first quarter. This variation increases to about 14% in the 10th quarter. This means that the variation in inflation as a result of GDP shocks become increasingly more important with time. The other control variable money supply is the least in explaining inflation in both the first quarter and the 10th quarter. About 1.7% of the variation of inflation in the 1st quarter is explained by shocks in money supply, and about 7% of the variation in inflation is explained by shocks in the money supply in the 10th quarter.

These results appear to bolster the granger causality results which established that import prices granger caused inflation in Namibia. The response of inflation to the shock in import prices decreased overtime as compared to the response of inflation rate resulting from the shocks in GDP and money supply. The fact that shocks to import prices are significant in explaining variations in inflation both in the short term and in the long run emphasise the significance of imported inflation in the Namibian economy, which is highly imported dependent.

5.1.7. IMPULSE RESPONSE FUNCTIONS

The primary use of the VAR is to derive the impulse response function which helps in tracing the reaction of the endogenous variables to one standard deviation shock to a disturbance term in the system. In this section, the study focused on how the import price shocks impact inflation in Namibia (Table B3)**.** It should be noted that inflation responds significantly to shocks in import prices in the short and in the long horizon. The response of inflation to shocks in import prices equilibrates around the baseline as from the 20th quarter onwards.

These results show that, a shock in import prices caused inflation in Namibia to respond positively. This appears to corroborate to the granger causality and the forecast error variance decomposition results discussed earlier. All these results pointed towards the importance of import prices in influencing prices in Namibia. The fact that all these three tests appear to reinforce each other and help to unequivocally affirm the importance of import prices on the Namibian economy which is highly import dependent. This means that Namibia is importing inflation from its trading partners in a significant way.

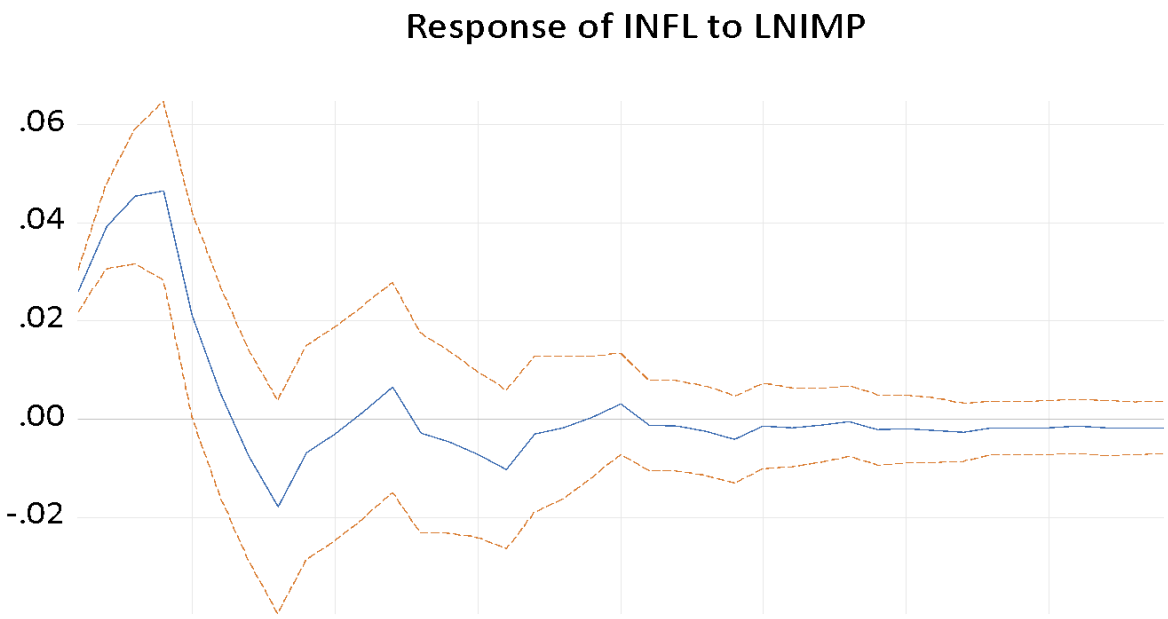

FIGURE 4: RESPONSE OF INFLATION (INFL) TO IMPORT PRICE (LNIMP) SHOCKS

Source: Author's compilation using E-views

5.1.8. DIAGNOSTIC TESTS

Four tests are used in the study to establish the reliability, stability and validity of the results obtained. These tests include the roots characteristic polynomial tests for parameter stability of the VAR, the autocorrelation test, the heteroscedasticity test and the normality test. If most of these tests show that there is no problem with the results, the results are accepted as robust and reliable.

Table 7 shows the results for the roots of the characteristic polynomial used to test for parameter stability in a VAR. Since the moduli for all the roots lie between 1 and -1, this implies that the Var parameters are stable and reliable. It should be noted that if the parameters lie outside these bounds then the parameters of the VAR are deemed unstable and unreliable.

TABLE 7: DIAGNOSTIC TESTS OF INFLATION RATE MODELS

H_0	H_1	Test	Statistic: Model
Error term is normally distributed	Error term is not normally distributed	JB-Joint	45.09 (0.00)
Homoskedasticity	Heteroskasticity	χ^2	64.74 (0.72)
No serial correlation		LM-test-χ^2 (lags 3 and 5)	3.71 (0.21)

Figures in parentheses indicate P-value.
Source: Author's compilation

The model passed all the diagnostic tests. These show that the VAR results have stable parameters and do not suffer from either autocorrelation or heteroscedasticity. The possible existence of normality problem has been observed. We can therefore state that the results are reliable and valid.

5.2. SUMMARY

The chapter analysed and discussed the findings of the study. First, the chapter carried out unit root tests by using both the informal graphical method and the formal ADF and the PP methods. The results showed that all the variables are integrated of order (1) and the Johansen cointegration test result shows that there is no long-run relationship among the variables. Second, the VAR model was estimated and the lag length was determined, with the chosen lag of 2. Third, Granger causality, forecast error variance decomposition and impulse response function techniques were conducted. Finally, the chapter checked for the validity and reliability of the results and found that the results were valid and reliable because the models passed all the diagnostic tests. After all these tests had been carried out, the study found no cointegration between import prices and inflation rate, hence VAR estimation techniques. Import prices granger causes inflation at 1% significance level. Thus Namibia tends to import inflation from its trading partners both in the short and long run. Other variables found to significantly cause inflation is real GDP. This is also imminent by the fact that real GDP shocks become increasingly more influential as time goes by. Interestingly, M2 found to have no effects on inflation in Namibia. This is also explained by a very insignificant shock effects from M2 through inflation which stood at maxima of 7%.

CHAPTER SIX: GENERAL CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1. GENERAL CONCLUSIONS

The objectives of this study were to observe the direction of causality between inflation rate and import prices, to examine the impact of import prices on inflation rate, to observe the effect of a shock in import prices on inflation rate and to present and discuss economic policy implications thereof. The study analysed the model using quarterly data for the period from 1998Q2 to 2017Q4. The ordinary least squares (OLS) of vector autoregression (VAR) approach were employed to test for granger causality and impulse response function of import prices on inflation rate. The general informal tests for non-stationarity found that all the variables have trends. This finding was corroborated by the ADF and PP formal unit root tests which found that all the variables used in the VAR model were non-stationary in levels but stationary in first differences.

The study concluded that, at the lag length two (2), the inverse roots of the characteristic VAR polynomial have a modulus of less than one (1) and lie inside the unit circle, which implies that the parameters in the VAR model are stable and there is also no autocorrelation. The study also concluded that there is no cointegration in the VAR model. The causality test result showed that import prices granger-cause inflation. This postulates that there is a possibility that Namibia imports inflation from other countries, particularly, South Africa where Namibia gets about 80% of it is imports.

The study further determines that, inflation shocks are important in influencing inflation in both the short and long horizons using the forecast error decomposition since shocks to import prices significantly influence variations in inflation in Namibia. In addition, forecast error variance decomposition bolster the granger causality results, which established that import prices granger cause inflation in Namibia. The fact that shocks in import prices are significant in explaining variations in inflation emphasise the significance of imported inflation in the Namibian economy which is highly import dependent. As a result, a shock in import prices result in inflation responding positively. This corroborates the granger causality results and the forecast error variance decomposition results. Given all these results, the study found that import prices are important in influencing prices in Namibia. This means that Namibia is importing inflation from its trading partners in a significant way.

6.2. POLICY RECOMMENDATIONS

Based on the results of this study, this study has made some recommendations.

This study has indicated strongly that import prices significantly brought about inflation in Namibia. This could be because Namibia imports most of the commodities it consumes, especially from South Africa. Since Namibia is part of the Common Monetary Area (CMA) with South Africa dominating the bloc in terms of trade, it is evident that Namibia has been importing stable inflation thereof through the objective of monetary policy mechanism. It is therefore recommended that Namibia should continue to be part of the CMA to continue the preference of importing stable inflation while developing a modality of independent monetary policy.

In addition, the government should put more efforts to substitute imported goods and services, particularly, daily goods such as energy, food and clothing with those manufactured locally. In doing so, more money would be spent on locally produced goods rather than on imported ones. In this way, imports would be discouraged, and exports would be promoted, thereafter realising "growth at home" campaigns by the Ministry of Industrialisation and SME Development. This is in line with Namibia's goal and objective to achieve industrial nation by 2030.

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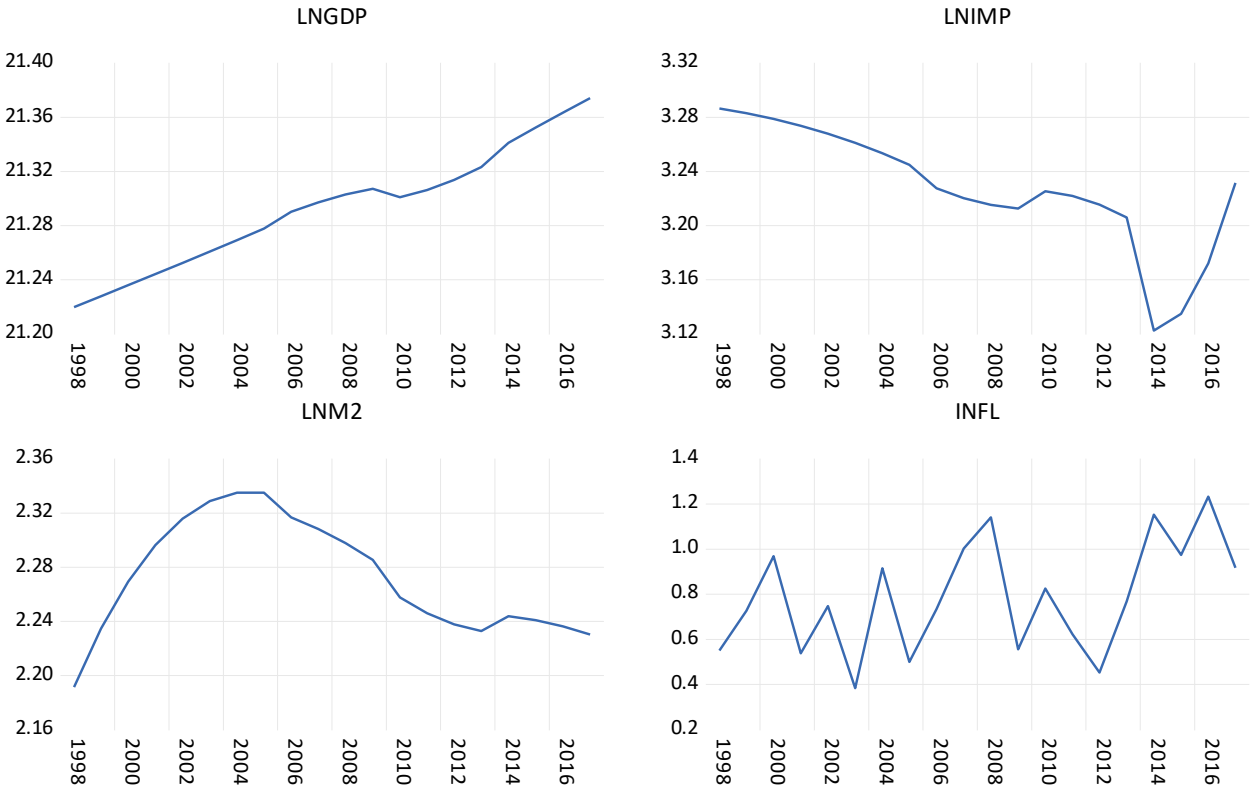
APPENDIX A: FIGURES

Fig A1: TREND DIAGRAMS OF THE VARIABLES



Source: Author's compilation

APPENDIX B: TABLES

Table B1: ROOTS OF CHARACTERISTIC POLYNOMIAL

Root	Modulus
0.982974	0.982974
0.794607 - 0.146743i	0.808043
0.794607 + 0.146743i	0.808043
-0.228288	0.228288

No root lies outside the unit circle.
VAR satisfies the stability condition.

Table B2: VAR RESIDUAL SERIAL CORRELATION LM TESTS

Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	22.00409	16	0.1431	1.561357	(16, 22.0)	0.1639
2	18.11835	16	0.3170	1.193224	(16, 22.0)	0.3440
Null hypothesis: No serial correlation at lags 1 to h						
Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	22.00409	16	0.1431	1.561357	(16, 22.0)	0.1639
2	38.14880	32	0.2100	1.175676	(32, 12.7)	0.3943

*Edgeworth expansion corrected likelihood ratio statistic.

Table B3: VECTOR AUTOREGRESSION ESTIMATES

Vector Autoregression Estimates				
Date: 10/07/18 Time: 17:04				
Sample (adjusted): 1998Q2 2017Q4				
Included observations: 79 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
	LNIMP	INFL	LNGDP	LNM2
LNIMP(-1)	1.104489	-1.358944	-0.004455	7.99E-05
	(0.04032)	(0.90011)	(0.00686)	(0.01400)
	[27.3906]	[-1.50975]	[-0.64939]	[0.00571]
INFL(-1)	0.002910	0.805667	0.000407	0.003505
	(0.00299)	(0.06668)	(0.00051)	(0.00104)
	[0.97419]	[12.0817]	[0.80145]	[3.37871]
LNGDP(-1)	0.138526	-0.885185	0.998263	-0.101983
	(0.04116)	(0.91880)	(0.00700)	(0.01429)
	[3.36547]	[-0.96341]	[142.566]	[-7.13577]
LNM2(-1)	-0.017440	-0.301336	-0.003067	0.942458
	(0.02170)	(0.48448)	(0.00369)	(0.00754)
	[-0.80353]	[-0.62198]	[-0.83065]	[125.061]
C	-0.811640	5.966457	0.015122	0.575908
	(0.24757)	(5.52628)	(0.04212)	(0.08596)
	[-3.27844]	[1.07965]	[0.35906]	[6.69968]
R-squared	0.971401	0.745566	0.999122	0.995838
Adj. R-squared	0.969855	0.731813	0.999075	0.995613
Sum sq. resids	0.000278	0.138766	8.06E-06	3.36E-05
S.E. equation	0.001940	0.043304	0.000330	0.000674
F-statistic	628.3727	54.21043	21057.60	4426.410
Log likelihood	383.8489	138.5081	523.7797	467.4153
Akaike AIC	-9.591111	-3.379952	-13.13366	-11.70672
Schwarz SC	-9.441145	-3.229987	-12.98370	-11.55675

Mean dependent	0.806726	-0.071824	5.323479	0.568315
S.D. dependent	0.011173	0.083619	0.010850	0.010170
Determinant resid covariance (dof adj.)		1.27E-22		
Determinant resid covariance		9.78E-23		
Log likelihood		1553.426		
Akaike information criterion		-38.82092		
Schwarz criterion		-38.22106		
Number of coefficients		20		