Effect of Exchange Rate on Inflation in Nigeria

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Certification

This is to certify that Olamilekan Olanrewaju, Olaosebikanwith Matriculation number LCU/PG/001333carried out this research work titled "Effect of Exchange Rate on Inflation in Nigeria" in Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan, Oyo state, for the award of Master Degree(M.Sc) in Economics and that this has not been previously submitted.

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Dedication

I dedicate this dissertation to God Almighty the most merciful and beneficent.

Acknowledgement

I give all the glory to Almighty God for the grace and mercy for the successful completion of this project work.

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Abstract

This study was conducted to examine the effect of exchange rate on inflation in Nigeria. This was carried out as a result of the contradicting views on the influence of exchange rate on inflation rate in Nigeria. The study utilized secondary data from 1981 - 2020 and performed Augmented Dickey Fuller(ADF) and Phillip-Perron (PP) unit root tests to determine the stationarity of the variables used. TheGranger Causality Test and ARDL model were used as the method of analysis. The results of the unit root tests indicate that the variables were all stationary at the first level of difference, except for the GDP growth series which was originally stationary.The Granger causality tests revealed that, there is bi-directional causality between exchange rate and inflation rate in Nigeria. In addition, the result of the ARDL showed that there is co-integration relationship between official exchange rate and inflation in Nigeria. It was further found that the causal effects of other major macroeconomic variables on inflation in Nigeria revealed that there is no granger causality relationship between GDP growth and inflation, likewise between unemployment rate and inflation. Based on the empirical evidence of the study, it can be concluded that the official exchange rate could not impact any significant influence on inflation rate, even though there is causality because the official exchange rate behaves differently from the real exchange rate and the parallel price.In view of the realities of casual relationship between the official exchange rate and inflation in Nigeria, it is recommended that the government should create an environment that encourage investmentby putting in placegood infrastructures, security which willboost the nation's productivity and reduce capital flight.

Keywords: Inflation, Exchange Rate, Unemployment Rate, Economic Growth

Word Count: 280

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Chapter One

Introduction

1.1 Background to the Study

Exchange rate policies in developing countries are often sensitive and controversial, mainly due to the kind of structural transformation required, like reducing imports or expanding non-oil exports, which invariably imply a depreciation of the nominal rate of exchange. Such domestic adjustments, thanks to their short-run impact on prices and demand, are perceived as damaging to the economy[1]. Ironically, the distortions inherent in an overvalued rate of exchange regime are hardly a subject of debate in developing economies that are dependent on imports for production and consumption. the talk rather focuses on the degree of fluctuations in the exchange rate in the face of internal and external shocks.

One of the crucial challenges to policy operation far and wide the earth and specially in rising and developing husbandry has been the result of changes in exchange rates on affectation and profitable conditioning. it's believed that rate of exchange movements would produce domestic profitable deformations and have an effect on a country's profitable aggressiveness. The hurtful results of rate of exchange placement is well proved within the literature and there is generally disinclination on the aspect of policymakers to regulate exchange rates, because of the perceived negative effect on the frugality, substantially thanks to pass- through goods[2].

A study have found that the effect of rate of exchange on inflation rate varies in different countries asserting that one of the factors determining the way exchange rate affects inflation rate is the development level of each country's financial markets revealing that new theories emphasize the high correlation between economic growth and innovation. rate of exchange influence domestic prices through their effects on

aggregate supply and demand. generally, once a currency depreciates it'll end in higher import costs if the country is a global value taker, whereas lower import costs result from appreciation. the doubtless higher value of foreign inputs related to rate of exchange depreciation will help to increase the marginal prices and allow to better value domestic made merchandise[3].Also, import competing companies may increase costs in response to foreign rival value will increase to spice up profit margins. However, the extent of such value adjustment depends on a selection of things like market structure, the relative number of domestic and foreign firms within the market, the character of government exchange rate policy and product substitutability[4].

The study of economic research work has shown that the impact of inflation usually resulted into various economic crisis[5]. Inflation and rate of exchange are important variables of economic performance as they determine output growth and demand conditions in an economy. Inflation is known as a sustained rise in a general level of prices[6]. High inflation has economic and social costs. It increases production costs, reduces confidence in money as a store of valuecreates market inefficiency, discourages long-term investmentsand ultimately negatively affect economic growth process[7,8,9].Furthermore, inflation affects investment planning and international competitiveness of a rustic . Inflation is amongst the macroeconomic problems that has got to be kept at a suitable level to enable the economy to grow sustainably. rate of exchange , which is that the price of foreign currency in terms of domestic currency affects the economy because it influences international flows of goods, services, and financial capital. Volatile rate of exchange creates uncertainty about future profits from export trade, which could affect firms' investment decisions within the long run[10].

This study therefore undertakes to empirically estimate the relationships between rate of exchange and inflation in the short run as well as in the long run using Nigeria as case study. The study aims at providing insights into the interrelationships among the discussed variables, which are important in assessing the performance of the implementation of monetary policy.

1.2Statement of the Problem

One of the major goals of a modern economic system is to keep prices of goods and services stable at rates that would not be detrimental to the economic system. The attainment of this goal, of ensuring that prices don't rise continuously, is extremely crucial in that non-attainment of the goal carries with it dire micro and macroeconomic consequences. Inflation in Nigeria was as a results of increases in real exchange rates which probably had origins in either endogenous demand shocks or exogenous foreign producer pricing shocks which caused the marginal costs of Nigerian producers to increase. Secondly, there existed inflation persistence within the economy that was not effectively curtailed by the monetary authorities[11]. Globally, it's believed that inflation is mainly caused by excess demand/or decline in aggregate supply or output. Given financial condition , such increase in aggregate demand results in an upward pressure in prices. Such a situation is named DPI[12].

According to a scholar, many determinants that end in the fluctuation of the exchange rate include; the openness of the economy, the domestic and foreign funds , the rate of exchange regime, interest rates, financial institution independence, output level, inflation and changeable circumstances. It's been said that the exchange rate governance has not important of an effect on the volatility of exchange rate but only in the case of fixed exchange rate unlike floating ones. On the opposite hand, the openness of the economy doesn't have any effect in the volatility of exchange rate

because of the relationship between the real exchange rate volatility and trade integration, with which they need a negative correlation. Their link is explained by the model with tradable and non-tradable sector to elucidate the effect of openness of economy on the volatility of exchange rate. More open economies have a more flexible aggregate price index . This, therefore, reduces the consequences of anticipated money shocks. It further leads to low real exchange rate volatility in the countries with high economic openness[13].

The problem of a way t cut back inflation has been a central issue among policymakers since the Nineteen Seventies. Notwithstanding the obtainable knowledge that shows that the Nigerian economy has on the common veteran moderate inflation within the pre-SAP amount, the unfavorable consequences of inflation have since assumed an intolerable dimension since the amount of SAP and after SAP until the present day. The extent of the effect of inflation in Nigeria might be appreciated from the following examples: in 1985, it stood at 5.5 percent, indicating an annual percentage increase of 20.1% compared to 40.9% in 1989. When the worth of crude oil slumped in 2015, Nigeria's petroleum , which sold at slightly above US$100 per barrel in 2014, fell to US$50 by August 2016. This triggered off a series of developments within the economy[14].One example of such developments is that the state of fiscal crisis as reflected in the persistent budget deficit, which culminated to approximately N44.88 billion in 2015[15].Monetary policy became extremely expansionary as an outsized an element of the deficit incurred throughout this era were supported through the creation of credit therefore the native domestic credit to the economy and most of the increase was attributable to the net claim by the government[16].

The fluctuation in export earnings thanks to fall and rise in the oil price in the international market has led to the problem of exchange rate fluctuation. Nigeria government despite adopting a series of rate of exchange policies has failed to keep the naira value stable over time. Nigeria currency keeps on falling in reference to the dollar. the present decline in the value of naira has led to a series of economic problem like economic recession, high inflation, high unemployment among other macroeconomic problems. While some scientist disputes the power of modification within the real charge per unit to enhance the balance of developing countriesbecause of snap of their low export, others believe that structural policies might, however, modification the long-run trends within the terms of trade and thus the prospects for export-led growth. Instabilities of the exchange rate are also a problem to the economy as it determines the value of the country currency in acting as a medium of exchange[17].

The very year SAP commenced, rate of exchange stood at N2.02: US$1.00 but in 1987, 1990, 1991 it depreciated to a mean of N4.02, N8.04 and N9.91 to US$1.00 respectively. Also, in 1992 and 1993 it depreciated to N17.30 and N22.05: US$1.00. In 1994, there was a requirement for the complete reversal of exchange rate policy due to the continuous depreciation of the exchange rate, thus with the re-introduction of a hard and fast exchange rate regime which made N21.8861 = US$1.00. The dismal performance of the frugality as at the top of 1994 led to there-introduction of the request- grounded approach under the independent foreign exchange request(AFEM) from January 1995 until October 1999. The rate of exchange which downgraded further from the fixed rate of N21.8881US$1.00 in 1994 to N81.00 US1.00 in 1995, and in but a time after it was fixed to N84.38US$1.00 and N92.65$ 15$1.00 in 1998 and 1999 independently. likewise, it downgraded to

N128.75 between 2002 and 2005. still, Nigerian rate of exchange was fairly stable in 2003 and between 2005 and 2008 Naira appreciated. The Naira – rate of exchange as at 2011 was162.30 but fell to156.15 in 2012 and an redundant decline to155.73 in 2013. The Naira- Dollar exchange value was largely unpredictable towards the top of 2014 and in 2015with 168 for 1 USD, 204 for 1 USD in February 2015 but latterly reduced to 197 for 1 USD as at August 2015[18].

It follows that price (exchange rate) is related to inflation which represents the persistent increase in the general price level of goods and services in a particular economic setting. Thus within the pursuit of macroeconomic stability, the monetary policy makers have often set targets on intermediate variables which include the rate of exchange , growth off funds and interest rate. Among these variables of financial policy, the rate of exchange is argued to have a lesser influence on the frugality through its effect on the value of domestic currency, affectation, external sectors pointers, macroeconomic pointers credibility, capital overflows and stability. Increased rate of exchange directly affects the prices of imported goods and increase the price of imported goods and services contributes directly to increase in affectation in Nigeria. Since there are clashing(positive, neutral and negative) views on the impact of exchange rate on affectation in Nigeria. In light of the afore – determined issue, this current study seeks to investigate how exchange rateinfluence inflation in Nigeria over the period of 1980-2019.

1.3 Objective of the Study

The main objective of this study is to examine the effect of exchange rate on inflation in Nigeria. The specific objectives of the study are to:

i. examine the causalty between exchange rate and inflation in Nigeria.

ii. determine the extent at which exchange rate affects inflation in Nigeria economy.

1.4 Research Questions

This study seeks to provide answers to the following research questions:

i. What is the causalty of exchange the rate and inflation in Nigeria?

ii. What is the extent at which the exchange rate affects inflation in Nigeria economy?

1.5Research Hypothesis

The following research hypothesis are to be tested in this study:

H_{o1}: There is no significant relationship between exchange rate and inflation in Nigeria.

H_{o2}: Exchange rate does not affect inflation in Nigeria economy.

1.6 Justification for the Study

Existing studies have examined several econometric studies on the determinants of and its impact on output in Nigeria[1920]among others.

The adverse consequences of inflationary pressure from rate of exchange instability have been a serious concern for economists, monetary theory authorities and policy analyst, due to the fact that exchange and inflation rate are major macroeconomic indicators for measuring economic performance. Consequently, assessing link between monetary policy, rate of exchange and inflation rate is very essential because the understanding of the relationship between these variables is a prerequisite for adoption of inflation targeting as a monetary policy strategy which the Nigerian government have made a prime objective in the attainment of its macroeconomic objective. Rate of exchange has to be right since it has a meaningful price that impacts

on other prices. Where the volatility of rate of exchange persists, things will be counterproductive in actualizing the goal of price stability. It impacts on inflation, money growth, income and rate of exchange which its movement has remained the focal issue when examining the long term causes of inflation in an economy[21]. Inflation is fundamentally a monetary phenomenon. this is often because it is usually associated with a continuous and consistent rise in general price in an economy. In Nigeria fiscal system for case, a big problem that has always been at the fore is the astronomical inflationary trend and devaluation in the value of naira. The inflationary trend within the country has been a source of concern and this has had some unknown effect on the profitable growth, import and import growth, finances, rate of exchange volatility and a general macro profitable insecurity. Affectation features a relation with exchange rate as well as movement of exchange rate. therefore affectation has been linked together of the commonest instantiations of profitable insecurity. it's generally associated with prices and pricing which leads to a disequilibrium between effective purchasing power and available affair of goods and services.

In addition to the below, the frequent financial deficiency operation within the last two decades in which budget deficiency is financed through banks has further wielded upward pressure on the general price position. this means that the current affectation may have been caused by these factors. While the channels through which rate of exchange deprecation affect prices are well known, the extent to which this miracle engenders price affectation in Nigeria is one among the defense for the study. For prudent policy expression it's of vital significance to probe the possible confines, through which it's generated. It must be added, that this study is of relevant not only to Nigeria but it most the countries confronted with economic problem especially as a result of various common features..

1.7 Scope of the Study

The data used were mainly thirty-nine year financial indications of exchange rate variations and inflation in Nigeria covering 1980 to 2019 which were sourced from CBN Statistical Bulletin (various issues), CBN Annual Report (various issues), International fund and International Financial Statistics Year Book (various issues). the amount of observation was used with the aim of providing adequate and rich sample base for inferential analysis. This also provides adequate degrees of freedom required for performing statistic analysis which involve short-run dynamics and adjustments towards long-run equilibrium. The scope is additionally chosen since it covers important eras in the evolution of the Nigeria economy particularly military and democratic regimes and the Structural Adjustment Programme.

1.8Operational Definition of Terms

Inflation: a persistent rise in the general price level of good and services.

Exchange Rate: the value of one currency for the purpose of conversion to another currency.

Fiscal Policy: is the means by which a government adjusts its spending levels and tax rates to monitor and influence a nation economy.

Monetary Policy: is policy adopted by the monetary authority of a nation to control either the interest rate or money supply.

Unit of Account: the value of something is measured in a specific currency.

Interest Rate: the amount charged expressed in percentage of the amount lent, deposited or borrowed.

Geopolitical Risk: a risk to an investment in a specific geographic area with natural disaster.

Job Market: is the market in which employers search for employee and employees search for job.

Central Bank of Nigeria: is the central bank andapex, monetary authority in Nigeria**.**

Balance of Payments (BOP): is a statement of all transactions made between entities in one country and the rest of the world over a defined period of time, such as a quarter or a year.

End Notes

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Chapter Two

Literature Review

This chapter discussed in detail each concept as it relates to the objectives of the study. The conceptual review gives an in-depth exposure for a better understanding of the following concepts which are Exchange rate and Inflation in Nigeria. The Chapter furthered gave proper illustration to the interrelationship between exchange rate and inflation in Nigeria. Under the literature review, a comprehensive summary of previous research on casualty relationship between exchange rate and inflation in Nigeria was analysed. Overview of key findings, concepts and developments from other studies was examined. Also, the theoretical review focused on the various theories of exchange rate and inflation by establishing what theories already exist.

2.1Conceptual Issues

2.1.1Exchange Rate in Nigeria

The rate of exchange is the price of one currency in terms of another currency, that is, the present market price for which one national currency can be exchanged for another. It's normally expressed as the number of units of a domestic currency that will purchase one unit of a foreign currency or the number of units of a foreign currency that will purchase one unit of a domestic currency. As an example, the naira per us (US) dollar (N/US$) or US dollars per naira (US$/N). If 1 US Dollar is exchanged for N240, then one naira is exchanged for US$0.0042. The rate of exchange plays a critical role in an economy because imports and exports constitute a large part of the economy[1].

Exchange rate is the price at which a unit of country's currency is exchanged for another country's currency at any point in time. the worth at which the Nigerian N1

is exchanged for $1 is exchange rate. Exchange rate has been defined as the price of the unit of one country's currency quoted in terms of another country's currency,it's the mathematical, qualitative or quantitative expression of 1 country's currency in terms of another[2]. It has also been seen as the domestic price of a unit of foreign currency and exchange rate can be called the conversion factor that determines the rate of change of currencies[3]. Some others defined exchange rate as the price of one country's currency in relation to another country, or the specified amount of units of a currency that can buy an amount of units of another currency.

Basically, rate of exchange changes affect the price of imported goods, services and our exports. When the worth of a currency, for case the naira falls, imported goods come premium, and that we tend to reduce the volume of our significances. At the identical time, other countries can pay less for some of our products that are exported and that will tend to boost export sales and foreign exchange earnings as well as the country's export industries competitiveness in the international markets.

There are two main sorts of exchange rates in Nigeria; official and market exchange rates. The sanctioned rate of exchange is determined by the financial authority/ central bank, while the request rate of exchange is principally determined by request forces of demand and force. When the demand for exchange exceeds supply, the worth of the Naira will go up, and if rate of exchange supply exceeds demand, the worth of the Naira will go down [6].

2.1.1.1 Cross Exchange Rate

A cross rate of exchange is the exchange rate between two currencies to a third currency. That is, the rate of exchange between two currencies expressed in terms of the exchange rate between them and a third currency. For instance, given the US

dollar/naira and Japanese yen/naira exchange rates, the dollar/yen rate of exchange becomes the cross exchange rate. It are often calculated as the ratio of the US dollar to the Nigerian Naira divided by the ratio of the yen to the Nigerian Naira (two different currencies compared to a third currency)[1].

2.1.1.2 End-Period Exchange Rate

The end-period rate of exchange simply refers to the final exchange rate prevailing at a particular period. An end-period rate of exchange is the exchange rate ruling on the final working day of a given period. As an example, there are often weekly, monthly, quarterly and yearly end-period exchange rates counting on the frequency. Within the case of yearly frequency, the last rate of exchange at end-December would be taken as the end-period exchange rate. The end-period exchange rates are usually applicable to stock variables, like external reserves and financial assets[1].

2.1.1.3 Average Exchange Rate

Average exchange rates are the arithmetic average of the daily and monthly exchange rates during a given period. The typical exchange rate is determined by dividing the sum of the exchange rate by the number of units that make up the period. For instance, 30 days during a month for the monthly average exchange rate or twelve months for annual average exchange rate[1].

2.1.1.4 The Appreciation/Depreciation of the Exchange Rate

The rate of exchange of the naira simply refers to the amount of domestic currency (in this case, Naira) required to get a foreign currency. When the quantity of naira required to buy a unit of a foreign currency falls, the naira is claimed to appreciate or strengthen or increase in value and when the amount of naira rises, the naira is claimed to depreciate or weaken or decrease in value. Depreciation is caused either by

a decrease in demand for domestic currency or a rise in supply of the domestic currency, while an appreciation is caused by a rise in demand for domestic currency or a decrease in supply of domestic currency[1].

2.1.2 Factors Responsible for Exchange Rate Movements

Movements in rate of exchange are not only determined by the forces of demand and supply, but also by the wellbeing of the economy, particularly, during a floating exchange rate regime. In this regard, the quantity of goods and services a country produces and sells (exports) to the rest of the world and the amount of foreign exchange earnings and level of external reserves are very important. Thus, where a rustic exports exceeds its imports, the country earns more exchange and increases its external reserves. The increase in external reserves makes the domestic currency to understand and stronger in value. However, when a country's exports are lower than imports, the country draws down on its foreign reserves to buy the extra imports. This may cause the external reserves to reduce and if the trend persists, the domestic currency is probably going to depreciate in value and becomes weaker[7].

Changes in interest and inflation rates also can cause exchange rate fluctuations. Foreigners tend to require advantage of high interests by bringing their money into the domestic economy; this increases the supply of foreign currencies, the domestic currency to appreciate. Other factors that influence rate of exchange movements in an economy include balance of payments position, market expectations, and socio-political climate[9].

2.1.3 The Foreign Exchange Market

The exchange market is a globally decentralized market for trading convertible currencies through a global network of banks, corporations and individuals. The

market which is usually driven by speculation, arbitrage and professional dealings operates “over the counter” with enormous turnover. This huge turnover has made the market the most important financial market in the world. An enormous volume of trading transactions at the market is done largely on electronic trading platforms and the 24-hour dealing desk. Trading at the worldwide foreign exchange market is done by large global investors and retail individuals with computer-driven algorithmic trading strategies. The synergy from these market participants has greatly fine-tuned and set new standards for the worldwide financial market in general[10]. It's material to note then that despite the strides achieved so far, the worldwide foreign exchange request is still evolving and in a transition period as different new trading actors continue to crop as the request structure changes. Accordingly, the worldwide foreign exchange request is presently an admixture of old and new rudiments.

Among the world's financial centers, the most important amount of foreign exchange trading (32 per cent) takes place in the United Kingdom, despite the very fact that the British pound sterling—is less widely traded in the market. The US and Japan account for 18 and 8 per cent, respectively, of the worldwide foreign exchange transactions[1]. The European semicircle and Asian time zone constitute the three largest global foreign exchange requests, counting for about 58 per cent of the entire global trade. The worldwide foreign exchange request is a 24- hour request where, piecemeal from possible minor gaps on weekends, fiscal centers are open for business nearly on the earth. In financial centers round the world, business hours’ overlap; as some centers close, others open and start to trade. The exchange market follows the sun around the earth, so it's said to be a 24-hour market. The concept of twenty-four-hour market means exchange rates and market conditions can change at any time in response to prevailing economic and market conditions. Thus, traders and other market

participants must be aware of the possibility that a sudden movement in an exchange rate can occur during an off hour, elsewhere within the world[12].

2.1.4 The Linkage between Exchange Rate Policy and Economic Growth

Within and out of theoretical realm, there's accepted/optimal exchange rate will enhance economic growth. While macroeconomics and microeconomic analysis of rate of exchange system are relied upon in the former, supply and demand analysis of the impact of changes in oil price is employed in the latter[13]. The rate of exchange system adopted by a country majorly depends on its need and level of development attained. The free floating rate of exchange system where exchange rate is determined by the forces of demand and supply which has been found to have worked for developed countries like US and UK has not been successful in developing countries. As an example, Nigeria government announced the reintroduced a versatile exchange rate system on 15th June2016 to strengthen the value of the local currency and ease pressure on external, yet the worth of the local currency kept on depreciating against the US dollar, even up to the purpose of N520 per 1US dollar in the black market[11]. Theory does not clearly articulate how exchange rate regimes can affect economic growth, and there are a limited number of studies which investigate this relationship[14]. While controlling the likely impact of rate of inflation, gross capital formation (%GDP), index of state spending, and index of human capital per person and using data from 74 countries for year 2012.

2.1.4.1Determinants of Exchange Rate in Nigeria

Apart from other macroeconomic factors such as inflation, interest rate, index of commercial and gross fixed capital formation among others, rate of exchange is one of the pivotal determinant of the health of a country. The mechanism of rate of

exchange determination are different systems of managing the exchange rate of a nation's currency in terms of other currencies and this should be properly done in a way that will bring about efficient allocation of scarce resources so as to achieve growth and development[15]. Economist have pinpointed factors that determine the adoption of a specific exchange rate system. Rate ofinterest, inflation, balance of payment, accounting balance and debt burden have been adjudged to be the most influential elements facilitating the adoption of any exchange rate system. In addition, there are some divergent view in this regard. Scholars have found that among other macroeconomic fundamentals, inflation was the determinant of real rate of exchange and that purchasing power parity option is the best determinant of real exchange rate[13].

2.1.5Inflation

The concept of inflation has been define as a persistence rise within the general price level of broad spectrum of goods and services in a country over a long period of time. Inflation has been intrinsically linked to money, as captured by the usually heard maxim inflation is too much money chasing too few good. Economists usually attempt to distinguish inflation from an economic phenomenon of a onetime increase in prices or when there are price increases in a narrow group of economic goods or services[17].

Rate of inflation is measured as the percentage change in the price index (consumer price index, wholesale price level, producer price level etc.)[17]. The consumer price index (CPI), as an example, measures the worth of a representative basket of goods and services purchased by the average consumer and calculated on the basis of periodic survey of consumer prices. Due to the different weights the handbasket, changes within the price of some goods and services have impact on measured

affectation with varying degrees. There are several disadvantages of the CPI as a measure of price indicator. First, it does not reflect goods and services bought by enterprises and/ or government, like ministry. Secondly, it does not reflect the change in the quality of goods which might have passed overtime. Thirdly, changes within the price of interchangeable goods aren't captured. Incipiently, CPI handbasket generally does not change often18.

Despite these limitations, the CPI remains the most extensively used dimension of the general price position. This is frequently because it's used for indexation purposes for numerous pay envelope and payment earners(including government workers). Another measure of affectation or price movements is that the GDP Deflator. This is frequently available on an periodic base. still, it's infrequently used as a measure of affectation. This is frequently because the CPI represents the cost of living and is, thus, more applicable for measuring the weal of the people. Furthermore, because CPI is out there on a more frequent basis, it's useful for monetary policy purposes. In recent times, there are three dominant schools of thought on the causes of inflation; the Neo-classical/monetarists, Neo-Keynesian, and structuralists. The Neo-classical/monetarists stated that inflation is driven mainly by growth in quantum of cash supply[19]. However, practical experiences of the Federal Reserve System in the United States (US) have shown that this may not be entirely correct. The US funds growth rates increase faster than prices itself. This has been traced to the increased demand for the US dollar as a worldwide trade currency. The Neo-Keynesian attributes inflation to diminishing returns of production. This happens when there is an increase in the velocity of money and excess of current consumption over investment[20].

The structuralists attribute the explanation for inflation to structural factors underlying characteristics of an economy[21]. As an illustration, within the developing countries, particularly those with a robust underground frugality, current hoarding or hedging, individualities anticipate unborn prices to extend above current prices and, hence, demand for goods and services are not only transactionary, but also preventative. This creates artificial dearths of products and reinforces inflationary pressures.

The literature is replete with those factors that would affect the position of affectation. These factors are frequently grouped into institutional, financial, financial and balance of payments. Several studies have shown that the extent of independence(legal, executive, and instrument) of the financial authority is a pivotal institutional factor determines affectation, especially, in industrialized countries, while rate of development of fiscal institution governors in developing countries was seen as an important factor impacting affectation. still, caution should be exercised within the interpretation of these findings, given the problem in measuring the factual position of independence of a central bank. The financial factors relate to the backing of budget poverties, largely through plutocrat creation process. Under this view, inflation is claimed to be caused by large financial imbalances, arising from hamstrung profit collection procedures and limited development of the fiscal requests, which tends to extend the reliance on seiniorage as a source of deficiency backing [22, 23].

The monetary factors and demand side determinants include increases within the level of money supply in excess of domestic demand, monetization of oil receipts, interest rates, real income and exchange rate[16]. Prudent monetary management has been found to assist the reduction in the level and variability in inflation. The balance of payments or supply side factors, relate to the consequences of exchange rate movements on the price level. The rate of exchange devaluation or depreciation

includes higher import prices, external shocks and accentuates inflationary expectations. There are three major sorts of inflation according to Neo-Keynesians. The primary is the demand-pull inflation, which occurs when aggregate demand is in more than available supply (capacity). This phenomenon is additionally known as the Phillips curve inflation.

Within these broad typologies of inflation, there are other sorts of inflation with varying determinants, effects, and remedies, which are classified supported the intensity, severity and persistence of the worth increase[16].

Therefore, we've hyperinflation(an extreme acceleration of monthly price increases of three- integers chance point). Extremely high affectation(ranging between 50 and 100); habitual affectation(15- 30) and lasting for a minimum of 5 successive times); high affectation(with rates between 30 and 50 a time); moderate affectation(when the general price position ranges from 5 to 25- 30); and low affectation(when the change in the consumer price indicator ranges from 1- 2 to 5). for any affectation below zero, an frugality is regarded as passing deflation27. Menu costs of affectation itemizes all the vexation that individualities and enterprises face as tariffs are streamlined constantly and price markers are changed28.

This diverts the eye of profitable agents from other further productive gambles. Unintended changes in duty arrears, say a reduction may be treated as real earnings when inflows are unacclimated. This arises because, with a progressive taxation, rising nominal inflows are tested more. Wealth is redistributed between debtors and creditors, which can else be inferior, with unanticipated or inaptly anticipated inflation29. query becomes a costs, when in ages of unpredictable affectation, investors enterprises could also be reticent to invest in new outfit; individualities will be unintentional to spend as they're doubtful of what government would do next.

Through increased variability in relative prices, rising inflation would scale back the competitiveness of a country in the international market for goods and services. The negative effect of this on the balance of payments can't be overemphasized.

2.1.5.1 Types of Inflation in Nigeria

Generally speaking, Scholars have stated that inflation are often grouped into four types according to its magnitude[30] ;

1. Creeping inflation

2. Walking inflation

3. Running inflation

4. Hyper inflation

Demand Pull Inflation is caused by an increase in the conditions of demand; these could either be an increase in the ability to buy goods or an increase in the willingness to do so.

Cost Push Inflation arises from anything that causes the conditions of supply to decrease. A number of these factors include a rise in the cost of production, a rise in government taxation and a decrease in quantity of foods produced.

2.2Theoretical Review

Several theoretical perspectives are applied to explain the interrelationships among money supply, inflation, and rate of exchange. The rate of exchange pass-through inflation is also found suitable to understand and explain inflation. The attitude suggests that currency depreciation makes imports of intermediate and final goods more expensive, which are then omitted to domestic prices[31]. Whereas currency depreciation can stimulate export demand, supply constraints can put pressures on

domestic price as export and domestic demands increase. The effect of rate of exchange on inflation can also be explained from the perspective of a firm's behaviour. As firms become more aware of the cost increase due to the perceived persistent exchange rate fluctuation, they're more likely to increase the prices of goods and services to make profit[32]. The foregoing theoretical insights suggest that the direction of the connection can go either way; hence, the conclusion remains elusive.

2.2.1Theories of Exchange Rates

The following points highlight the top four theories of exchange rates. The theories are:

Purchasing Power Parity Theory (PPP):

Originally propounded by the sixteenth-century scholars of the University of Salamanca by Gustav Cassel in 1916, the concept of purchasing power parity (PPP) was revived in the interwar period in the context of the argument concerning the appropriate level which can reestablish international exchange rate parities.The theory posited that the equilibrium rate of exchange is determined by the purchasing power of two inconvertible paper currencies being equal. This means that the internal price situations of two countries impact the rate of exchange between two inconvertible paper currencies12. The proposition was Astronomically accepted as a long- run equilibrium condition within thepost-war period, it had been first supported as a short-run equilibrium by numerous transnational economists in the first many times following the breakdown of the Bretton Woods system in the early 1970s and also decreasingly came under attack on both theoretical and empirical grounds from the late 1970s to themid-1990s. Accordingly, over the last three decades, an outsized literature has built up that examines how much the data deviated from theory, and

therefore the fruits of this research have provided a better understanding of how well PPP is applicable in both the short run and the long run.

The purchasing power theorem as posited by Kuttner and Posen assumed that the traditional equilibrium exchange rate existing between two inconvertible currencies is determined by the ratios of their purchasing powers, hence the speed of exchange tends to be established at the point of equality between the purchasing powers of the two currencies[33]. In essence, when one country'srate of inflation rises relative to that of another country, decrease exports and increases imports depress the country's currency. The idea attempts to quantify inflation-exchange rate relationship by insisting that changes in exchange rate are caused by the inflation rate differentials[34]. In absolute terms, PPP theory states that the rate of exchange between the currencies of two countries equals the ratio between the prices of goods in these countriesimplying that exchange rate must change to adjust to the change in the prices of goods in the two countries[35] . However, the expected inflation differential equals the present spot rate and the expected spot rate differential[36]. The PPP in its simplest form asserts that within the long run, changes in rate of exchange among countries will tend to reflect changes in relative price level. Others are of the view that if exchange rates are floating, the observed movement are often explained entirely in terms of changes in relative purchasing power while if it is fixed, equilibrium are often determined by comparing satisfactory methods for[37]:

i. Explaining the observed movements in exchange rates for countries whose rates were floating

ii. Determining equilibrium parity rates for whose countries whose surviving rates were out of line with post war market conditions.

iii. Assessing the appropriateness of an exchange rate.

Despite criticisms of PPP theory, the theoretical foundation and explanation may sound reasonable and acceptable but its application in real situation may be an illusion, especially within the long run[37]. The pitfalls notwithstanding, PPP theory is usually a sine-quo-non in the exchange rate determination literature, and continues to stay relevant in the determination of exchange rate among countries of the world[38]. The PPP theory applies to commodities. There are two variants of the PPP: absolutely the PPP theory and the relative PPP theory. PPP states that there's a link between prices in two countries and the exchange rate between the currencies of both the countries.

The Theory makes three Assumptions:

i. There are not any transportation costs for transporting a commodity from one country to another (transportation costs are zero),

ii. There are not any costs for converting one currency into another (currency conversion costs are zero).

iii. There are not any restrictions on the movement of commodities between countries. That is, there are not any trade barriers or quotas.

Absolute PPP Theory:

The Law of 1 price states that an identical product should have the same price in two countries. Consistent with the PPP theory, the law of 1 price should operate for an identical commodity sold in two countries. Therefore, the worth of a product in country X and the price of an identical product in country Y (in Y's currency) should be such that, the ratio of the costs is the exchange rate between the currencies of the two countries.

When PX is the worth of a product in country X, PY is the worth of an identical product in country Y, X is that the currency of country X; while Y is that of country Y, then:When the Law of 1 price is violated, arbitrage opportunities arise—commodities that sell at a lower cost in country X will be transported to country Y (recall that transportation costs are assumed to be zero) and sold at the greater price prevailing in the country. This may continue till prices in both countries equalize. Absolute PPP isn't relevant with respect to non-tradable goods (such as electricity, healthcare services) that can't be transported to another country and are not traded in international markets.

Relative PPP Theory:

When the rate of inflation is higher in country X than in country Y, the worth of goods in X will increase more than the price of goods in Y. Since the Law of 1 price states that an identical product should have the same price in both countries, X's currency will depreciate with reference to Y's currency. The speed of depreciation is equal to the inflation differential.

When P is the commodity's current price, and I the expected inflation rate, the price of the commodity an year later (P_1) is:

$P_1 = P_0 (1 + I)$

In country X – $P_{X1} = P_{X0} (1 + I_X)$

In country Y – $P_{Y1} = P_{Y0} (1 + I_Y)$

The ratio of the prices one year later is – $[P_{X0} (1 + I_X)] \div [P_{Y0} (1 + I_Y)]$

This can be written as $S_{X/Y} [(1 + I_X) \div (1 + I_Y)]$ as $(P_{X0} \div P_{Y0})$ is the current spot rate, $S_{X/Y}$. Since the expected exchange rate one year later, $E(S_{X/Y})$, is a ratio of the prices one year later, it is nothing but –

$E(S_{X/Y}) = S_{X/Y}[(1+ I_X) + (1 + I_Y)]$ …(1)

The above equation can be rearranged as $E(S_{X/Y}) \div S_{X/Y} = [(1 + I_x) + (1 + I_Y)]$

The left hand side of this equation can be written as – :

$1 + \{[E(S_{X/Y}) – S_{X/Y}] \div S_{X/Y}\}$

where $\{[E(S_{X/Y}) – S_{X/Y}] \div S_{X/Y}\}$ is nothing but the rate of change in the spot rate.

Denoting $\{[E(S_{X/Y}) – S_{X/Y}] \div S_{X/Y}\}$ by 'e' – $(1 + e) = [(1 + I_X) \div (1 + I_Y)]$

On simplification, $e = (I_X – I_Y) + (1 + I_Y)$

The denominator on the right hand side, $(1 + I_Y)$ can be ignored for small values of I_Y Then,

$e \approx (I_X – I_Y)$ … (2)

This equation states that e is approximately equivalent to $(I_X – I_Y)$. Since e is nothing but $\{[E(S_{X/Y}) – S_{X/Y}] \div S_{X/Y}\}$, the relative PPP theory states that the speed of change in the spot rate is approximately equal to the inflation differential. When this condition holds true, the market is in equilibrium. Relative PPP is closer to reality than absolute PPP, because it accommodates non-tradable goods too—the theory talks of changes in prices (captured by changes during a price index whose composition includes non-tradable goods).

Interest Rate Parity Theory (IRP):

It is also known as the covered interest parity theory. The rate of interest parity characterizes the relationship between interest rate and exchange rate of two countries. It assumes that the rate of exchange of two countries will be affected by their interest rate differentials. The rate of interest parity tries to relate interest rate of one country to the exchange value of her trading partner. In other words, rate of interest charge in

a country is a reflection of the exchange value of the currency of that country and her trading partners(s). Accordingly, the difference within the rate of interest in two countries should be able to explain the exchange value of the currencies of the countries[40]. Thus, when interest rates are low, exchange value of the domestic currency in reference to international currencies will be low (devaluation). The reverse is that the case if interest rates are high. But where relative interest rates levels exist, a rise in a country's interest rates will lead to a depreciation of its currency[41]. This is often same as traditional flow model, which posits that increase in domestic rate of interest relative to foreign interest rate causes an appreciation of the exchange rate through induced capital inflow[42]. Thus, changes in rate of interest (interest rate differentials) can cause major changes in the exchange rates[43]. The nexus between exchange rate and interest rates can be explained in the following steps: Increasing domestic present interest attracts more foreign capital, Increasing preference to get more foreign-dominated bonds, Increasing demandforforeign currencyput pressure on the worth of foreign currency[44]. This therefore goes to point out that the relationship between interest rate changes and the exchange rate volatility is usually inverse relationship. Hence, the rate of interest structures between two economies show their exchange rates. Interest rates differentials are therefore a serious determinant of exchange rate[45, 46].

The theory states that there is a link between the nominal interest rates in two countries and the exchange rate between their currencies.

The theory applies to financial securities, and it makes the subsequent assumptions:

1. When a currency is converted into another, or when a financial security is bought or sold, there are not any costs involved.That is, transaction costs are zero.

2. Money can freely flow between both the countries and there's full mobility of capital.

3. An investor can prefer to invest in financial securities that are denominated in the currency of the country where he resides (domestic currency-denominated financial securities) or to invest in financial securities that are denominated in the currency of a foreign country (foreign currency-denominated financial securities). If he chooses to take a position in foreign currency-denominated financial securities, he will hedge his exchange risk through operating in the forward market.

Based on the above assumptions, the idea states that the forward exchange rate for two currencies (FX/Y) is determined by the current spot rate (SX/Y), and therefore the nominal interest rates (iX and iY) in two countries.

The forward rate is:

$$F_{X/Y} = S_{X/Y} \{[1 + i_X] \div [1 + i_y]\} \qquad \ldots(3)$$

Rearranging the above equation (which is similar to the equation for the expected spot rate $E(S_{X/Y})$ in relative PPP theory), gives

$$(F_{X/Y} - S_{X/Y}) \div S_{X/Y} = (i_x - i_y) \div (1 + i_y)$$

Note that the term $(F_{X/Y} - S_{X/Y})$ on the left hand side of the above equation is negative when $F_{X/Y} < S_{X/Y}$ (the forward rate is at a discount to the current spot rate). When $F_{X/Y} > S_{X/Y}$, it means that the forward rate is at a premium to the current spot rate. When the denominator $(1 + i_F)$ on the right hand side of equation is ignored for small values of i_y, then equilibrium is said to exist when,

$$(F_{X/Y} - S_{X/Y}) \div S_{X/Y} \approx (i_x - i_y) \qquad \ldots(4)$$

When the left hand side of (4) is greater than the interest rate differential $(i_X - i_F)$, profit-making opportunities through covered interest arbitrage, exist. According to the

IRP, when the quoted forward rate is identical to the forward rate calculated using equation 2, an investor will be indifferent to investing in securities nominated in domestic currency or foreign currency, if the return in either case is identical. When he's indifferent to the currency denotation of the fiscal securities, equilibrium exists.

If however, the quoted forward rate is not the same as the forward rate calculated using equation 2, an investor can make a profit by borrowing in one currency, converting it into another currency, investing the proceeds, and covering himself against exchange rate risk. This process is called covered interest arbitrage (CIA).

Equilibrium Condition under IRP:

The rate of change in the forward rate and the spot rate in illustration 3 was:

$= (F_{X/Y} - S_{X/Y}) \div S_{X/Y}$

= (Rs. 45.7315 – Rs. 43) ÷ Rs. 43 = 0.0635 or 6.35%

The rate of change in the nominal interest rates was

$= (i_X - i_Y) \div (1 + i_y) = (0.1167 - 0.05) \div (1 + 0.05) = 0.0635$ or 6.35%

Since these two rates are identical, there was equilibrium, and no scope for CIA.

International Fisher Effect (IFE) Theory:

It is also called the uncovered interest parity theory. This theory states that the forward rate ($F_{X/Y}$) and therefore the expected spot rate [E ($S_{X/Y}$)] will be identical because, even without covering rate of exchange risk in the forward market, actions of market participants will make them equal.

When the forward rate is bigger than the expected spot rate:

All market participants will sell the dollar forward, hoping to shop for the dollar in the spot market at the expected spot rate on the day that the forward contract has to be

honoured. At now, profit-making opportunities disappear, and because the theory states, the forward rate ($F_{X/Y}$) and therefore the expected spot rate $E(S_{X/Y})$ will be identical[47].

When the forward rate is a lower quantum than the anticipated spot rate request actors will buy the one forward, hoping to form a profit by dealing it in the spot request at the anticipated spot rate on the day that the forward contract has to be fete. When everyone buys ones forward, the forward rate will rise until it becomes acceptable to the anticipated spot rate. At now, profit-making opportunities disappear, and because the theory states, the forward rate ($F_{X/Y}$) and therefore the expected spot rate E ($S_{X/Y}$) will be identical[48].

Thus, market actions will make the forward rate rise until it equals the expected spot rate. From the mathematical point of view, consistent with this theory

$E(S_{X/Y}) = F_{X/Y}$

According to equation 2, $[E(S_{X/Y}) - S_{X/Y}] \div S_{X/Y} \approx (I_X - I_Y)$

and as per equation 4 $(F_{X/Y} - S_{X/Y}) \div S_{X/Y} \approx (i_X - I_Y)$

$\therefore (i_X - i_Y) = (I_X - I_Y)$ and $(i_X - I_X) = (i_Y - I_Y)$

From the Fisher equation $(i_X - I_X) = r_X$ and $(i_Y - I_Y) = r_Y$

According to the International Fisher Effect, $r_X = r_Y$

This is called the Fisher Open Condition. It states that the real interest rates in countries are equal.

Unbiased Forward Rate Theory (UFR):

It states that the forward rate is an unbiased predictor of the expected spot rate because the actions of market participants make the 'n' period-forward rate be

adequate to the expected future spot rate. This is often the equilibrium condition under the UFR theory where market actions will ensure that the 'n' period-forward rate is an 'unbiased predictor' of the expected spot rate 'n' days hence, There's an equal probability that the 'n' period-forward rate will be either higher or lower than the expected spot rate 'n' days later[49].

Comparison of the elemental Parity Conditions:

The above theories are valid as long as the assumptions are satisfied. The PPP theory's assumptions are: zero transportation costs and free mobility of products between countries. Even when the assumptions hold, demand for commodities in several countries is dependent on cultural, climatic, religious and ethnic preferences. Rice consumption in South Asia is more widespread and better than in other parts of the world. So, an analogous product faces different levels of demand in different countries.

Even when a price level is used to overcome this problem, the basket of products that form the index (index composition) varies across countries, as do the weights of individual commodities. There's substantial evidence to show that the Law of One Price does not always hold good and that domestic prices do not change in response to changes in exchange rates, which PPP does not hold true in the short run.

According to the IRP theory, the forward rate is decided by the current spot rate and nominal interest rates in two countries. But there are often differences between the forward rate and the actual spot rate on that date. This happens when the forward premium is principally a function of the demand and supplyfor the currencies in the spot and forward market.

Different economists have presented different theories on inflation. The economists who have provided the theories of inflation are generally classified as monetarists and structuralists.Monetarists associated inflation to the monetary causes and suggested monetary measures to regulate it. On the opposite hand, structuralists believed that the inflation occurs due to the unbalanced economic system and they used both monetary and fiscal measures together for sorting out economic problems[51].

2.2.2 Theories of Inflation

Mark up Theory of Inflation

In an frugality, when one or a group of merchandisers together decide a new price that's different from the competitive price, also the worth is nominated as request-power price. similar groups keep prices at the extent at which they can earn maximum profit without any concern for the purchasing power of consumers.

For illustration, within the once many times, the costs of onion were veritably-high in India. The soaring price of onions was the results of the group action of onion directors. In such a situation, people in middle and low income groups reduced the consumption of onions. still, onion directors earned high gains from advanced income group. harmonious with the advanced interpretation of request power proposition of affectation, oligopolists can increase the worth to any position indeed if the demand doesn't rise. This hike in price situations occurs thanks to increase in stipend(because of trade unions) in the oligopolistic assiduity. The rise in stipend is compensated with the hike in prices of products. With increase within the income of individualities, their purchasing power also increases, which further leads to inflation52.

Piecemeal from this, some economists concluded that financial and financial programs are not applicable in practical situations as these programs aren't suitable to control rise in prices situations. These programs would work only prices rise due to an increase in demand. also, these programs can not be applied to oligopolistic rise in prices, which is thanks to increase in the cost of product. Monetary policy can reduce the speed of affectation by raising the interest rate and regulating the credit inflow in the request. still, it might have no effect on the oligopolistic price as the cost is transferred to the prices of goods and services.

Conventional Demand- Pull Inflation

The demand pull suggests that the affectation occurs when the admixture demand for goods and services is lesser than aggregate force, such the attendant excess can not be satisfied by running down the being stock, diverting fat from exports request to the domestic request.

The request power proposition of affectation represents one extreme end of affectation. harmonious with this proposition affectation exists indeed when there's no excess in demand. On the contrary end, the traditional demand- pull proponents believed that the only cause of affectation is the excess of aggregate demand over aggregate force.

In full employment equilibrium condition, when demand increases, affectation becomes necessary.

Mark- up proposition

Affectation refers to the affectation that occurs due to excess of aggregate demand, which further leads to the increases in price position. The rise in prices situations

stimulates product, but increases demand for factors of product. Accordingly, the value and price both increases.

In some cases, stipend also increase without rise within the redundant demand of products. This leads to fall in force at increased position of prices as to compensate the increase in stipend with the prices of products. The deficit of products within the request would affect in the farther increase of prices. thus, proposition handed a model of mark-up affectation during which both the factors, demand cost, are determined. Increase in demand leads to the increase of prices of products as the guests spend further on products. On the contrary the goods are vended to businesses rather of guests, also the value of product increases. As a result, the costs of products also increase. also, an increase in stipend results in increase in cost of product, which might further increase the prices of products49.

Bottle- Neck Inflation

Bottle- neck affectation was introduced by Prof Otto Eckstein. harmonious with him, the direct relationship between stipend and costs of products is the main cause of affectation. In other words, affectation takes place when there is a contemporaneous increase in stipend and prices of products. still, he believed that pay envelope drive or request- power propositions alone are not suitable to give a clear explanation of affectation. After analysis of inflationary situation, it was stated that the affectation occurs thanks to the smash in capital goods and pay envelope- price curl. also, the proposition proposed that in affectation prices in every assiduity is advanced, but many diligence show a really high price hike than rest of the diligence. These diligence are nominated as bottle- neck diligence, which are liable for increase in prices of goods and services[54].

The Monetarists:

The Monetaristsopined that "inflation is usually and everywhere" hence prices tend to rise when the rate of increase in money supply is greater than the rate of increase in real output of goods and services. Scholars explained this in line with Fisher's equation of exchange[46].

MV = PT . . . (1)

Where: M = Supply of cash

V = Velocity of cash in circulation

P = Price of products and services

and T = the transaction (output)

On the opposite hand, it was argued that imported inflation arises from international trade where inflation is transmitted from inflationary country to the opposite , especially during the amount of rising price all over the world[52].

2.3 Empirical Review

The literature is replete with empirical studies, which have been conducted across the globe to test the validity of the arguments advanced in the theoretical perspectives reviewed in the foregoing paragraphs.

Exchange Rate and Inflation in Nigeria

An empirical examination of the impact of exchange rate volatility on affectation in Nigeria using periodic time series data from 1986 – 2012. The methodology employed includes ADF, PP and KPSS test of unit root, Johansen Julius cointegration test, VECM, granger reason test, impulse response function and

frictiondecomposition.The result of the analysis verified that there's a positive and significant relationship between affectation, exchange rate volatility, plutocrat force and financial deficiency, while gross domestic product was observed to have negative relationship. The granger reason outgrowth showed abi-directional relationship between all the variables. latterly, exchange rate volatility is derived to impact affectation in Nigeria55.

A recent study with the same focus on volatility by examining the effect of exchange rate volatility on affectation in Nigeria using periodic time series data covering the period 1986- 2019. The fashion of analysis used are the generalized autoregressive tentative heteroskedasticity(GARCH) and vector error correction model(VECM) to determine the long run impact of exchange rate volatility on affectation. The study used consumer price indicator as a deputy for affectation being the dependent variable while nominal exchange rate(NER), plutocrat force(MS) import(IMP) and import(EPT) were used as the independent variables. The results of stationarity test indicated that the variables have mixed order of integration and bounds test forco-integration verified the actuality of a longrun relationship among the variables. Findings showed that plutocrat force(MS) and nominal exchange rate(NER) had positive and significant effect on consumer price indicator, meaning that affectation in Nigeria is caused by exchange rate oscillations as well as increase in plutocrat supply56.

Exchange rate pass- through effect at the aggregate position into import and consumer prices in Nigeria was examined for the period 1995Q1 – 2015Q1. exercising the Johansen approach to cointegration and a vector error correction methodology. It was set up that the exchange rate pass- through into Nigeria’s CPI inflation is deficient. The effect was discovered to be advanced in import than in consumer prices, inferring

that the pass- through effect declines along the pricingchain. The result of the analysis conducted in the study instigated that the magnitude of the pass- through goods in Nigeria indicates that the impact of exchange rate oscillations on trade balance may be relatively large. also, the external sector driven nature of the frugality suggests that shocks from global requests may have profound counteraccusations on affectation and other profitable conditioning. Accordingly, the financial authority may need to gauge applicable financial policy responses to pass through goods by icing exchange rate stability, anchoring affectation prospects and minimizing oscillations in profitable activities57.

Others have also examined the dynamic commerce between exchange rate, affectation and profitable affair in Nigeria between 1999 and 2017 using Vector Error Correction(VEC) granger reason test and Vector Error Correction Model(VECM). The results of the study established that there's unidirectional reason running from profitable affair(GDP) to change rate in Nigeria. The study further established that exchange rate significantly impact the long run positive impact on profitable performance in the country, while the impact of affectation on profitable affair in the long run is set up to be negative. In addition, profitable affair exerts a negative impact on both affectation and exchange rate, but affectation appreciatively influences exchange rate. Another substantiation reveals that in the long run, exchange rate deprecation impacts appreciatively on profitable affair, while affectation impacts negatively affair. The study suggested that policymakers should initiate measures that could prop fiscal and real sector development58.

Scholars have also examined the effect of exchange rate on affectation in Nigeria using the Vector Error Correction Medium(VECM) fashion of analysis with periodic data from the period of 1981 to 2015 sourced from the CBN statistical Bulletin World

Bank Data train and those of the Federal Bureau of Statistics. The end of the study was to determine the relationship between the dependent variable(affectation rate) and the independent variables(exchange rate,Non-oil import, and plutocrat force). The results of the analysis revealed that the shifting exchange rate has significantly impacted the continuity affectation that the country has witnessed. Also that high exchange rate has led to imported affectation and as such the financial authority in their hunt to check affectation shouldn't completely calculate on this instrument to control affectation, but should use it to round othermacro-economic programs. It was thus recommended that sweats should be boosted to increase the volume ofnon-oil import to make up for the redundant demand for foreign exchange59.

Affectation and exchange rate volatility pass through in Nigeria using VECM has been examined in this literature. The study aimed to vindicating whether exchange rate volatility has a direct effect on the affectation or not in Nigeria from 1981 to 2015. The result of the study revealed that exchange rate volatility doesn't Granger cause affectation in the short- run. still, in the long run all the variables contribute to change in affectation. It was also recommended that central bank of Nigeria should continue to take affectation targeting in the long term as also part of its financial policy governance and to also pay acceptable attention to the trade openness and FDI in managing inflation60.

A analogous study was carried out with ideal of examining the impact of exchange rate variation and affectation, their interactive effect on the Nigeria's profitable performance. The study used ARDL fashion of analysis. It was set up that there's a negative impact of both affectation and exchange rate on the frugality in the short run and a positive impact in the long run. The financial authorities should thus control the

movement of foreign exchange rate in order to dock the recent swell in affectation and also boost the performance of the country's frugality [61].

Exchange Rate and Inflation in Other Countries

Assessing the impact of exchange rate and affectation on the GDP of Iran, Iraq and Turkey during the period between 2005- 2020, some experimenters delved the connections between the variables exercising the data panel system biddable with statistical data from Iran, Iraq and Turkey. Data from the Central Bank of Iran as well as the World Bank were used for collect testing the suppositions. The result of the analysis of the study shows that the exchange rate has no effect on GDP in these countries, while affectation has a significant/ meaningful plus negative relationship with GDP. likewise, it was set up that Gross domestic product, per capita income and profitable growth rate are the most pivotal macroeconomic performance pointers. It was explained that contemporaneous with the position of product and per capita income indicating the average profitable weal/ fiscal status of individualities in society, the rate of profitable growth plus GDP's rate of increase or drop demonstrate how people in a society are doing as well as the rate/ speed of enhancement or drop in their position of weal/ well- being62.

Scholars with a view of exchange rate and affectation connections in other countries have also carried out several studies with colorful discoveries. A study probing the dynamics of affectation, plutocrat growth, exchange rate and interest rates in Ghana from 1990 to2017 employed the bus-accumulative distributed pause model(ARDL) and error correction model(ECM) the study because the studied variables were set up to be integrated andco-integrated at different intensities. The result of the study revealed that plutocrat force has no impact on affectation in the short and long run over the period under disquisition. Exchange rate and nominal interest rate were still

set up to impact affectation rate significantly in both the short and long run and in the same direction. It was thus recommended that the Bank of Ghana should maintain a stable profitable growth by establishing a rigorous financial polices as well as derivations vehicle for fiscal institutions in the country to act in complacence63.

A affiliated study in Sierra Leone aimed at furnishing quantitative analysis of the impact of plutocrat force and exchange rate oscillations on affectation. The study employed secondary data that were attained from the International Financial Statistics(IFS), which covers daily data from 1986 to 2019. The model was estimated using Vector Error Correction Medium(VECM). The statistical result of the analysis revealed that in the long run, plutocrat force and exchange rate have significant inverse goods on inflationary pressure, while real affair growth and foreign price changes have direct goods on inflationary pressure.

A study in Vietnam which aimed at slipping light on the goods of affectation on gold price and exchange rate in Vietnam set up a significant affectation impacts with the time- varying cointegration but not with the fixed measure cointegration models. In addition, financial policy affects exchange rate both directly via its instruments as plutocrat force and interest rate and laterally via inflation66. Others also examined the relationship between exchange rate and affectation in the Iranian Frugality using VAR model for estimation within the time frame 1976 to 2012. The result of the estimation set up that there's a direct relationship between exchange and affectation rate. The recommendation made was that central bank must be transparent in the operation of foreign exchange policy67.

A experimenter carried out a exploration work on the goods interest rate and affectation rate has on exchange rate in Gambia covering 2007 to 2018. This study was conducted due to the fact that there's no publicized composition that focuses on

the goods of interest rate and affectation on the exchange rate of Gambia. At the end of the exploration work, it was set up that there live a positive relationship between affectation and exchange rate and also a negative relationship between interest rate and exchange rate using Completely Modified Ordinary Least Forecourt(FMOLS), Dynamic Ordinary Least Forecourt(DOLS) and Canonical Co integrating Retrogression(CCR) 68.

also, another study was conducted with the ideal of examining the goods of exchange rate on affectation and also to show how the problems of affectation can be eased in Gambia. Secondary data was gathered from 1978 to 2016. The fashion used for estimation is OLS. It was set up that there's no long run relationship between exchange rate and affectation. It was recommended that the government should thus reduce her hindrance in the product of goods and services, and also measures have to be put in place to reduce the budget deficiency of the government[69].

Exchange Rate and Inflation in Other Regions

As a result, a study was carried out to examine the influence of exchange rate insecurity on the affectation – growth nexus of the region for the period of 2000 to 2018. Three major ways of assay were being made used of which are Pooled Mean Group(PMG), Generalised Moments(GM) and Dynamic Fixed Effect(DFE), to achieve the thing of the study. The GARCH(1, 1) was employed as well to induce exchange rate insecurity. The findings of the study showed that exchange rate insecurity and affectation have a negative relationship with profitable growth of the region. It was farther discovered that profitable growth of the region is greatly told by the consequential effect of exchange rate insecurity on affectation which indicate that the advanced the position of insecurity in exchange rate, the worse the inflationary-growth relationship of the region. It's thus recommended that expression of programs

as respects appreciation of original currencies should be the precedence of member nations70.

In a affiliated study fastening on ECOWAS, it was discovered that there's an absence of Beta and Sigma confluence between ECOWAS countries during the 1990- 2020 period. WAMZ countries, as a result of their flexible exchange rate administrations, had advanced rate of affectation compared to their WAEMU counterparts. still, reason tests between affectation and exchange rate revealed that WAMZ countries, unlike WAEMU countries, were victims of the Exchange Rate Pass- Through to affectation. The ideal was to see, among ECOWAS countries, if the difference between the fixed exchange rate governance of the WAEMU countries and the flexible administrations of the WAMZ countries on the other hand is a factor ofnon-convergence of affectation rates. The results show that WAMZ countries, due to their flexible exchange rate administrations, are subject to exchange rate pass- through(ERPT), unlike their WAEMU neighbour. also, the results of the estimates of the affectation discriminational model(IDM) reveal that neither the elaboration of the affair nor that of the plutocrat force, on both sides, explain thenon-convergence of the affectation rates between WAEMU and WAMZ countries, but they show that thenon-convergence of the affectation rates is significantly linked to the difference in the elaboration of the exchange rates71.

In an attempt to establish the possible actuality of a long- run interaction between interest rates, affectation, and exchange rates among five arising request husbandry(Brazil, India, Indonesia, South Africa, and Turkey), a study employed Autoregressive Distributed Lag(ADL) test for threshold cointegration using sample countries ' yearly time- series data from 2013 to 201812. The study discovered that there seems to be a long- run positive relationship between factual rates of affectation

rates and nominal interest rates. A cointegrating relationship between interest rates and exchange rates for the case of Brazil, India, and Turkey but not for the case of Indonesia and South Africa was also set up. It was farther discovered that exchange rates and factual rates of affectation in all the sample countries examined tend toco-move in the long- run, inferring that the deprecation of their currencies creates affectation through raising the prices of imported goods72.

In other regions like Western Balkan countries, experimenters have also delved empirically the connections between exchange rates and affectation in Western Balkan countries. The end of the study was to establish whether fixed exchange rates play a significant part in inflationary performance or whether flexible exchange rates perform as a better shock- absorbing instrument in the Western Balkans. The result of the study reveals that an exchange rate is still the main source of inflationary pressures in Western Balkan countries. Policy makers are advised grounded on the result of the study to weigh the relative costs and benefits associated with introducing a flexible exchange rate in small open husbandry because similar governance is likely to dodge further costs than benefits[73].

2.4 Theoretical Framework

The theoretical basis of this study is founded on the Purchasing Power Parity (PPP) theory. the idea which is an application of the Law of One Price across countries, may be a framework used to explain long-run movements of exchange rates. The theory integrates the goods and money market through relative prices of goods in the domestic and foreign markets[74, 75]. The theory suggests that identical goods are sold at the same price in different markets when the exchange rate is taken into account, all else being equal. As such, a change in one country's price affects the rate of exchange,such a domestic currency depreciates/appreciates proportionally to a change

in domestic price level relative to the foreign market price. The validity of the PPP theory is questionable because it works favourably well for tradable and perfectly substitute goods, while most goods are non-tradable and differentiated[76]. Nonetheless, the underlying logic of PPP behind rate of exchange movements makes the PPP theory pervasive.

Another perspective linking the rate of exchange and inflation is the exchange rate pass-through. the attitude suggests that in an open economy with a flexible exchange rate system, rate of exchange depreciation or appreciation will probably influence domestic consumer and producers' indices through import prices. Domestic price for imported goods responds to nominal exchange rates such changes in import prices are to some extent passed on to producer and consumer prices in the domestic markets[77]. Supported this perspective, it's clear that a country such as Nigeria, which relies much on imports for domestic consumption, production or the other purposes, is probably going to be highly susceptible to price fluctuations in exporting countries.

The balance of research during this area has been in favour of understanding and determining the degree of pass-through (strong or weak) and its associated factors rather than on the presence or absence of the pass-through. Scholars explained why the pass-through is likely to be incomplete.. Four factors were identified to that effect: (i) the degree of market integration, (ii) the degree of product differentiation, (iii) the functional form of the demand curve, and (iv) the market structure and the degree of strategic interaction among suppliers[78].

2.5 Gaps within the Literature

The empirical literature is replete with studies examining the interrelationships between money supply, inflation, and exchange with the aim of testing arguments of the theories highlighted above. Despite the useful insights highlighted above, earlier studies remain largely elusive; hence, no firm conclusion are made on the nexus among inflation and exchange rate, this might be ascribed to some factors including a span of data series used, econometric methodologies applied, and geographical contexts that change in the levels of institutional and socioeconomic development. during this respect, the findings from earlier studies lack external validity.

Elsewhere, some studies have been undertaken in this geographical context, the results are still inconsistent and lack common argument. Largely, the variation in empirical results reflects the differences within the variables including, the geographical context used, and econometric techniques applied that change in the sample size requirements. This suggests that further investigation is imperative which the present study will carry out in a bid to fill the gap in the literature. For instance , most studies on inflation and funds put exchange rates in the background, without directly testing its effect. Besides, earlier studies were conducted in several contexts; hence, their external validity is questionable. this is often because countries differ in the level of socioeconomic and institutional development, this might lead to variation in the effectiveness of monetary policy.

The gap within the empirical literature will be filled by empirically analyses the interrelationship between exchange rate and inflation in Nigeria. consistent with the available literature less consideration has been given to the direct empirical analysis of the effect of exchange rate on inflation. The present study will comprehensively analyse these channels to determine the most appropriate monetary channel to manage

inflation in the era of foreign exchange shocks. it's expected to be a worthwhile addition in the available literature regarding this issue.

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Chapter Three

Methodology

The chapter covers the methodology employed in the study and effort was made to describe the different tools and techniques used while analyzing the work. It presents research design, sources and measurement of variable, model specification, estimation techniques employed, and A Priori expectation.

3.1 Model Specification

The study employed the Autoregressive Distributive Lag Model (ARDL) bound test approach developed by Pesaran et al. to research the causal relationship among exchange rate and inflation[1]. Originally, Engle and Granger demonstrated that when variables (say X and Y) are co-integrated, there always exists a corresponding error correction representation[2]. Changes within the dependent variables are the function of disequilibrium in the co-integrating relationship captured by the error correction term and changes in explanatory variables[3].The ARDL bounds testing approach is more efficient with small samples and permits the analysis of the long-run and short-run relationships regardless of whether the underlying variables are I(0), I(1), or a mix of the two[4]. Though ARDL, model doesn't require a pre-testing for the unit roots, a critical condition is that the explanatory must not be I(2). As such, the test for unit roots might still be necessary to make sure that variables are not I (2). the overall ARDL model can be presented as shown in equation 1:

$$\Delta lnINF_t = \propto + \sum_{i=1}^{k+d} \beta \Delta lnINF_{t-1} + \sum_{i=1}^{k+d} \varphi \Delta lnER_{t-1} + \lambda_1 \Delta lnINF_{t-1} + \lambda_2 \Delta lnER_{t-1} + \omega_t \quad ..(1)$$

Where:

k Is the optimal lag order, and d is that maximum order of integration of the variables; ω_t is the stochastic error term, and denotes the first difference operator, whereas ER and INF are exchange rate and inflation rate, respectively, all in natural logarithm.

The part of the equation with coefficients β and φ represents the short-run dynamics of the model whereas the second part with coefficients λ_1 and λ_2 represents the long-run dynamic relationship. Based on equation 1, the hypotheses for empirical testing of the long-run relationship can be formulated as follows:

$H_0: \lambda_1 = \lambda_2 = 0$

$H_1: \lambda_1 \neq \lambda_2 \neq 0$

From hypotheses 1and 2, the bounds testing is conducted whereby the -test is performed to work out whether there exists cointegration among the variables under study. The results are then compared; the computed values of -statistics with the critical values[5]. If the null hypothesis is rejected, it implies that the long-run relationship exists. within the bound testing approach, if the computed -statistics lies below the boundary critical value, the null hypothesis can't be rejected. If the computed -statistics lies above the boundary critical value, the null hypothesis are often rejected, meaning that there exists a long-run relationship among the variables. there's also a possibility of no decision, which occurs when the computed -statistics fall within the lower and upper bounds..

Once cointegration is established, the conditional ARDL long-run model for INF can be estimated based on the following equation:

$$lnINF_t = \beta_0 + \gamma_1 lnER_{t-1} + \gamma_2 lnER_{t-1} + \gamma_3 lnRFM_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots (2)$$

All variables are as defined earlier, while μ is the error term. In this model, a dummy variable RFM is included in the long-run model, representing economic liberalisation taking into account policy regime switches in Nigeria from the centralised to market based economic policies. The dummy variable is important for determining whether economic reforms carried out by the country have any significant effect on inflation. Hence, D = 1 for a period after 1985 (National Rolling Plan, National Economic Empowerment and Development Strategic, Financial Sector Reform and Vision 2020 Framework) and D = 0 for the period before 1985 (during Structural Adjustment Programme).

The last step is obtaining the short-run dynamic coefficients, which entails estimating an error correction model. The ARDL-ECM model can be expressed as follows:

$$\Delta lnINF_t = \partial_0 + \partial_1 \Delta lnINF_t + \partial_2 \Delta lnER_{t-1} + \partial \Delta lnECM_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots \quad (3)$$

The coefficients ∂_1 and ∂_2 are the short-run dynamic coefficients of the model's convergence to equilibrium, while ECM is error correction term. Its coefficient, that is; ∂ measures the speed of adjustment. The coefficient of ECM is expected to be negative, implying that the dependent variable was above the equilibrium in the previous period, it would thus be corrected through a downward movement in the next period, that is period t.

3.2 Method of Data Analysis

The method of analysis used in this study is the statistical method of analysis. In statistical analysis, data is collected, organized, analyzed, interpreted, and presented using scientific and systematic methods which will be replicated. Statistical analysis utilized in this study can be broadly classified into two, namely; descriptive and inferential analyses. The descriptive analysis involves using numerical coefficients

that measure central tendency (e.g. mean) and dispersion (e.g. standard deviation) to explain the characteristics of the study's sample. Other sorts of descriptive analysis which will be conducted in this study includes frequency counts, normality measures like Jacque-Bera, Kurtosis, and skewness statistics. thanks to the time series nature of variables used for analysis, preliminary unit root tests are going to be applied in order to determine the nature of stationarity of the variables used. This proceeds from the underlying assumption of the series analysis that the variables to be used are stationary[6].

3.2.1 Unit Root Test and Lag Order Selection

The study will use two tests of unit roots namely, the augmented Dickey-Fullerr (ADF) test, a test developed by Dickey and Fuller and Phillips-Peron (PP) test, which was developed by Phillip and Peron[7,8]. In both tests, the null hypothesis is that a statistic variable has no unit root, meaning that it's integrated of order 0. By rejecting the null hypothesis, it suggests that the statistic variable is integrated of order 1 or higher. Hence, the statistic can be differenced to keep it stationary.

The lag length to be introduced within the causality test is an important practical question, because the causality test is sensitive to the amount of lags. during this respect, choosing the lag length more or but the true lag length can lead to model misspecification, which produces inefficient and inconsistent parameters during this study, the optimal number of lags is that the one selected by the majority of the lag selection criterias[9]. The optimal number of lags are going to be selected based on Final Prediction Error (FPE) criterion; Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HQIC), Schwarz's-Bayesian Information Criterion (SBIC) as they're the most commonly used methods.

3.3 Sources of Data and Requirement

Secondary data comprising of data of the below-discussed variables were used. These variables were collected from the CBN Statistical Bulletin, World Bank Development Indicators and Federal Bureau of Statistics. Its period of coverage spanned from 1980-2019. Its period of coverage spanned from 1980-2019. This era is chosen as it corresponds to the period where uniform and consistent data on the relevant variables are available. More importantly, this era witnessed several exchange rate regimes. All the variables were measured in monetary terms using Nigeria's currency (Naira). The study captured the systematic annual statistic of the considered variables in the model specification. Other relevant materials were gotten from the reviewed literatures of studies done by scholars during this area of study. The variables into account include the official exchange rate (OEXR) and this constitutes the dependent variable. The independent variables are the inflation (INFLA). The official rate of exchange values and the values for the independent variable were obtained from the CBN Statistical Bulletin, various years.

End Notes

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Chapter Four

Results and Discussion of Findings

This chapter presents the empirical analysis of the study subsequent to data gathered from sources described in the previous chapter. The chapter is organized thus: the outcomes of the preliminary analysis of the studied variables are presented in first section (4.1), while section 4.2 expresses results of the unit root tests. In section 4.3, the causal relationship between Exchange Rate and Inflation was reported, while in section 4.4, the extent and significance of this relationship were investigated and presented. Section 4.5 reports the causal relationship between some other macroeconomic variables and Inflation. Then, section 4.6 presents the discussion of findings.

4.1Preliminary Analysis

4.1.1Exploratory Analysis

The summary statistics are presented in Table 4.1. A total of 40 observations, without any missing observation were drawn for each of the 40 years understudied. The worst the GDP has gone through this period is a 13.1279% decrease, while the best growth it achieved was a 15.330% rise. The average GDP growth is however 3.026% increment. The lowest official exchange rate during this period is 0.6177, the highest is 358.81, while the average is 100.76. Inflation (in consumer prices) rose from 5.388 to 72.8355 within the period under study. Unemployment rate also rose from 1.8% to 30.4%. Since the mean of GDP growth and Official exchange rate is less than their middle (median) value, it appears that their respective distributions are skewed to the left, while the mean for inflation and unemployment rate is higher than their respective median value, indicating that their distributions are skewed to the right.

Table 4.1: Summary Statistics for the Variables

	GDP growth	Official Exchange Rate	Inflation	Unemployment Rate
Observations	40	40	40	40
NAs/Missing Obs.	0	0	0	0
Minimum	-13.1279	0.617708	5.388008	1.8
Maximum	15.32916	358.8108	72.8355	30.4
1st Quartile	0.284001	9.44169	8.516362	4.25
3rd Quartile	6.47667	151.1888	18.11603	13.9
Mean	3.026325	100.7601	19.0928	10.625
Median	3.698025	106.4643	12.71577	10.05
Standard deviation	5.453163	100.7283	16.84608	7.546429
Skewness	-0.77126	0.855599	1.747208	0.76118
Kurtosis	1.279501	-0.15309	1.890981	-0.43256
Jacque-Bera	8.0374	5.2655	29.626	4.3167
Probability Value	0.01798	0.07188	3.688e-07	0.1155

(Source: Author's computation using R version 4.1)

GDP growth has a negatively skewed distribution while others are positive but also skewed as explained above. Inflation has the highest degree of skewness which is almost 2. The values of kurtosis are generally more than 1, hence, they all have lighter tails (lesser observations towards the tails) than that of a normal distribution. The p-values of the Jarque-Bera normality test for GDP growth and inflation being less than 0.05 which is the significance level also indicates that they are less likely to be normally distributed. Official exchange rate and unemployment rate are looks more like they are normally distributed, because their p-values are higher than 0.05, the later having a greater likelihood since it has the highest p-value.

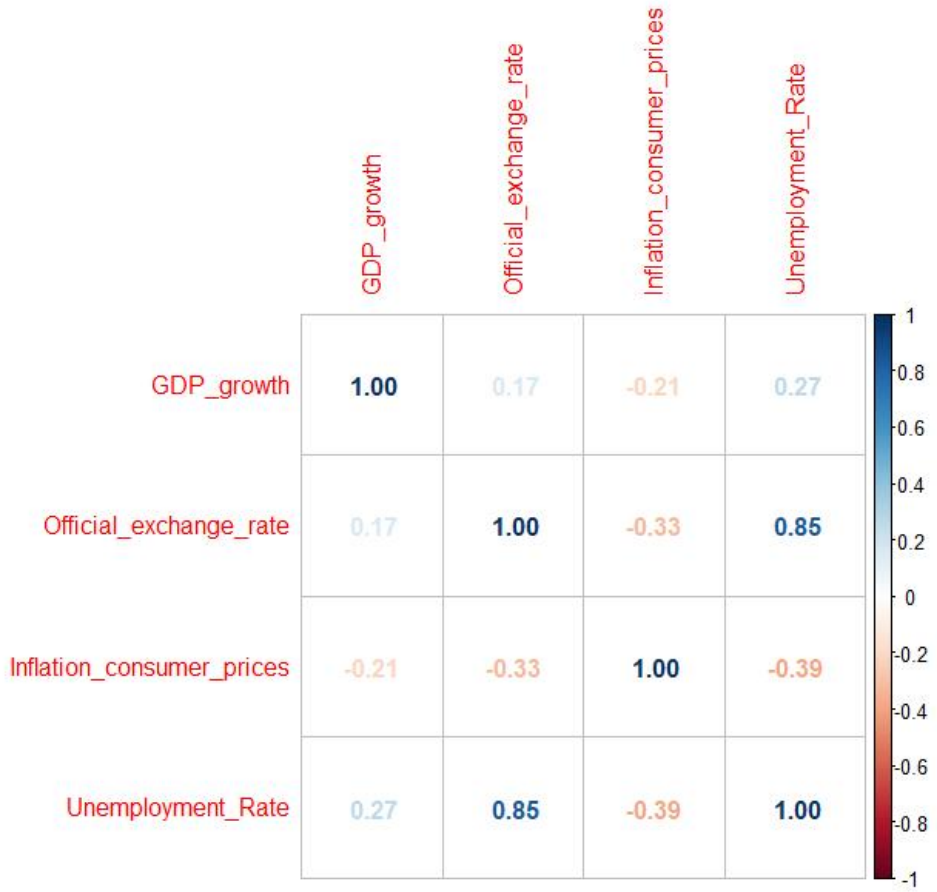
Table 4.2: Correlation Matrix for the Variables

	GDP growth	Official Exchange Rate	Inflation	Unemployment Rate
GDP growth	1	0.1661	-0.2125	0.2690
Official Exchange Rate	0.1661	1	-0.3276	0.8487
Inflation	-0.2125	-0.3276	1	-0.3927
Unemployment Rate	0.2690	0.8487	-0.3927	1

(Source: Author's computation using R version 4.1)

Table 4.2 and Figure 4.1 displays the correlation matrix table and plot respectively. All the variables have weak correlations with themselves except for unemployment rate and official exchange rate which has a strong correlation of 84.87%. However, inflation has a weak and negative correlation with other variables, even with official exchange rate. They move in different directions. None of the correlation coefficients is a cause for alarm, even the 0.8487. Multi-collinearity is therefore not an issue. According to Gujarati and Porter, a correlation coefficient less than 0.95 produces an acceptable Variance Inflation Factor (VIF) with very little impact of multi-collinearity on the model.[1]

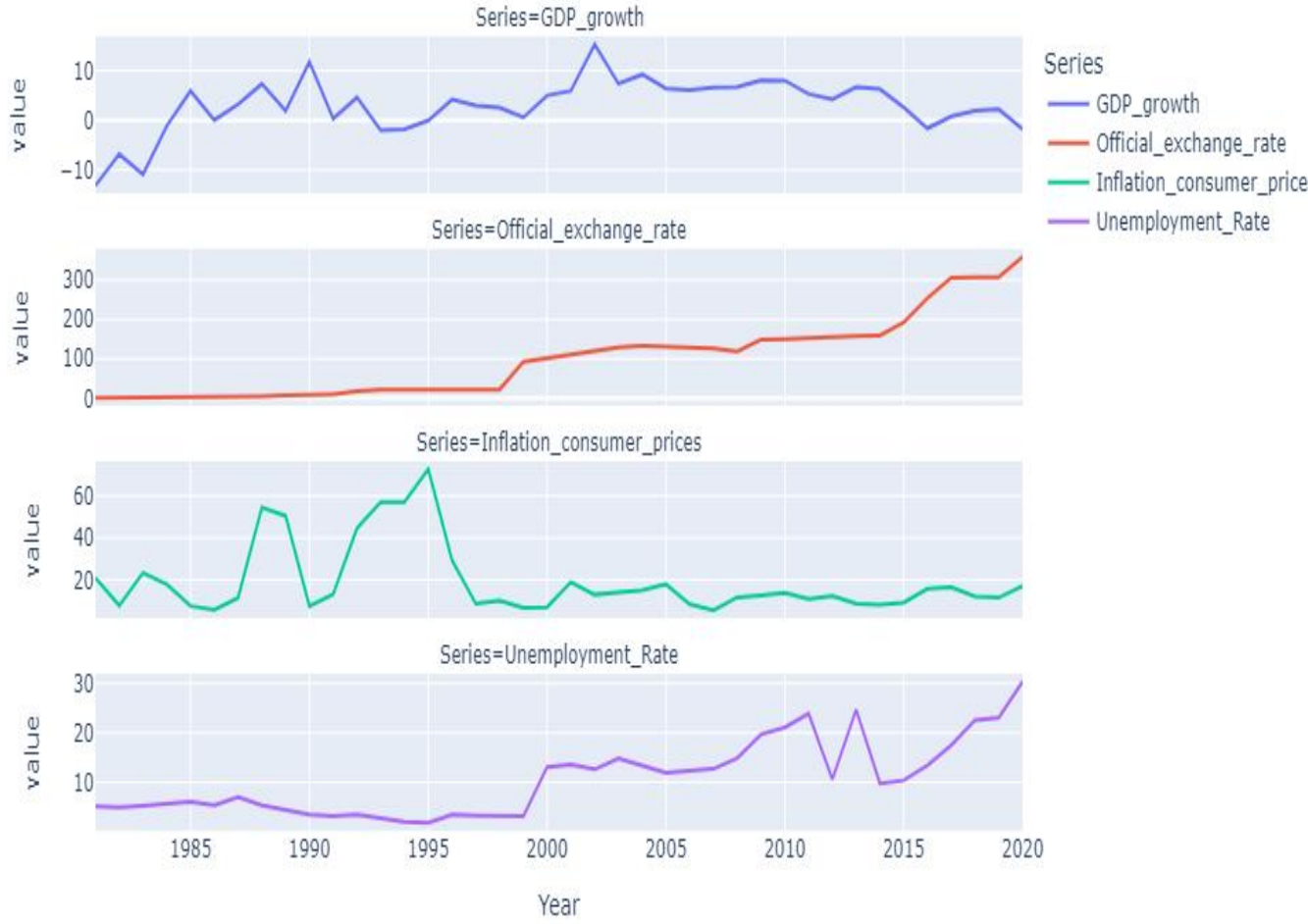
Figure 4.1: Correlation Matrix Plot for the Variables.



(Source: Author's plot using 'corrplot' library in R version 4.1)

The plot gives a visual representation of these relationships. The value in deepest blue color signifies the strongest and positive correlation of them all. This equals 1, and it is the correlation of each variable with itself. However, this kind of correlation is not of concern. The next to it is the 0.8487, approximated to be 0.85, which is the correlation between official exchange rate and unemployment rate. The others in blue are weaker correlation while the others in red are negative correlations. The deeper the intensity of the red color, the stronger the negative correlations.

Figure 4.2: Time Plot for the Variables understudied.



(Source: Author's plot using Python 3)

Figure 4.2 presents the plot of the variables during the period studied. It appears that trend and drift seems not to be serious issues with GDP growth and inflation series, unlike the official exchange rate and the unemployment rate series. Official exchange rate and unemployment rate had an average increment during this period, although official exchange rate seem to be the same in the early years. Inflation and GDP growth shows a fluctuating pattern instead. For inflation, the variation was sharp in the early years, but the variations dropped towards year 2001.

4.2 Pre - Estimation Test

4.2.1 Unit Root Tests

The unit root test is essential in order to examine the stationarity of the time series under consideration. It is believed and proven that time series modelling and analysis that does not the stationarity of the series will possibly produce spurious relationships. This could be avoided by examining the stationarity of the series using unit root tests (usually more than one, for confirmation). This will provide necessary information to avoid spurious relationships. The Augmented Dickey Fuller (ADF) and the Philip Peron's unit root tests have been employed for this purpose in our study. This is due to their simplicity of computation and interpretation. However, there is need for an optimal lag selection especially for an efficient Augmented Dickey Fuller unit root test, hence, the Akaike Information Criterion (AIC), Final Prediction Error (FPE) criterion, Hannan-Quinn Information Criterion (HQIC), and the Schwarz's-Bayesian Information Criterion (SBIC) have been chosen to evaluate the optimal lag order selection. The results are presented in tables 4.3 to 4.6 and displayed also in Figures 4.3 to 4.6. The custom here is to select the number of lags that gives the lowest information criteria. However, usually there are often cases where the different information criterion indicates differs choices, the route of this situation generally is to pick the criterion with the lowest number of lags.

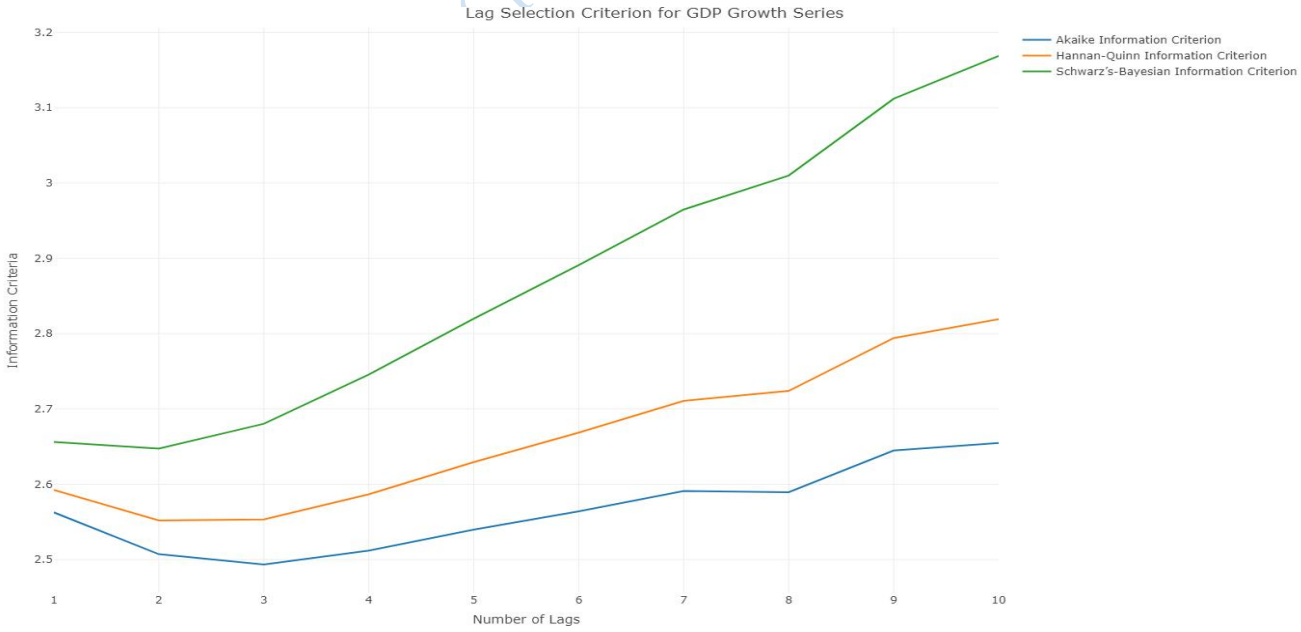
Table 4.3: Lag selection criteria for GDP Growth series

GDP Growth	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	2.563	2.507	2.494	2.512	2.54	2.564	2.591	2.59	2.645	2.655
HQ	2.593	2.552	2.553	2.587	2.629	2.669	2.711	2.724	2.794	2.819
SBIC	2.656	2.647	2.68	2.746	2.82	2.891	2.965	3.01	3.112	3.169
FPE	12.97	12.28	12.12	12.37	12.75	13.1	13.52	13.58	14.46	14.74

*(**Source:** Author's computation using R version 4.1)*

From table 4.3, AIC, and FPE both indicate that 3 lags are optimal since they have their lowest values at lag 3, while HQ and SBIC indicate that the optimal lag is at lag 2. These outcomes are displayed visually in Figure 4.3. Since there is disparity, our choice will be to pick the lowest number of lags which is lag 2 for the GDP growth series.

Figure 4.3: Lag selection Information Criterion plot for GDP Growth series.



(Source: Author's plot using the 'plotly' library in R version 4.1)

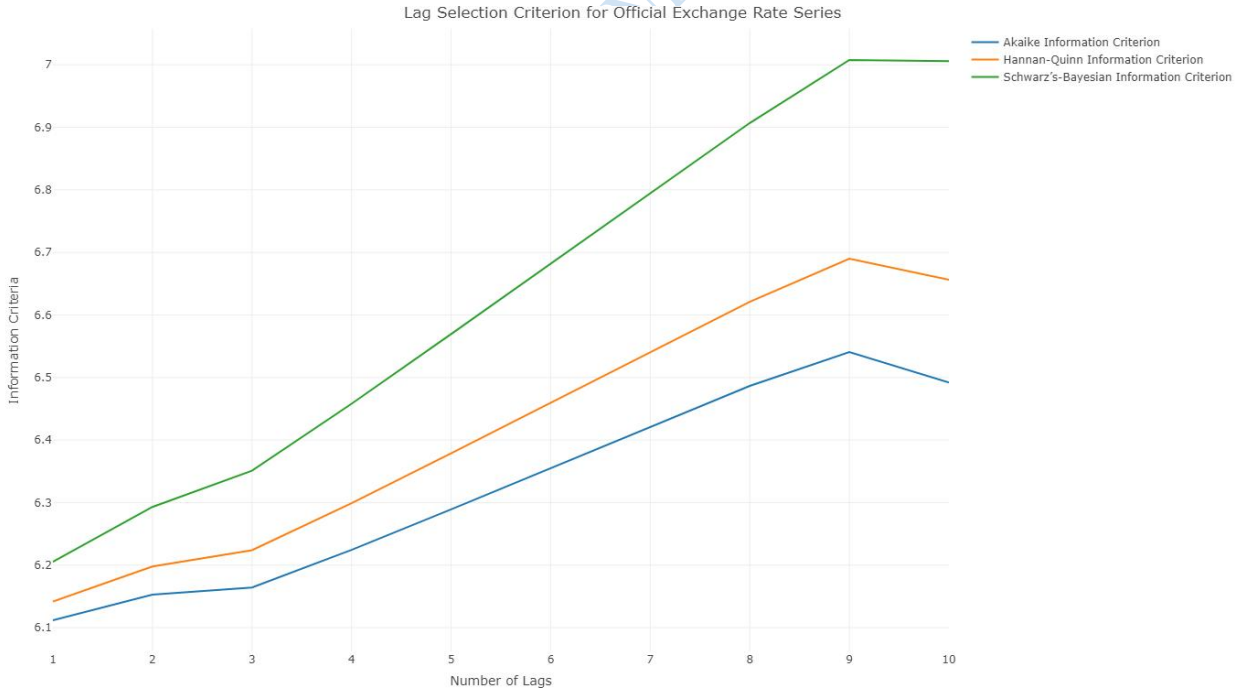
Table 4.4: Lag selection criteria for Exchange Rate series

Exchange Rate	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	6.112	6.153	6.164	6.225	6.289	6.355	6.42	6.487	6.541	6.492
HQ	6.142	6.198	6.224	6.299	6.379	6.459	6.54	6.621	6.69	6.656
SBIC	6.205	6.293	6.351	6.458	6.569	6.682	6.794	6.907	7.008	7.006
FPE	451.3	470.4	476.2	506.6	541.7	580.3	622.2	668.9	711.2	683.9

(Source: Author's computation using R version 4.1)

From table 4.4, all the information criteria seem to agree that lag order 1 is optimal for the exchange rate series. They all have their lowest values at lag order 1. This is also well represented in Figure 4.4.

Figure 4.4: Lag selection Information Criterion plot for Exchange Rate series.



(Source: Author's plot using the 'plotly' library in R version 4.1)

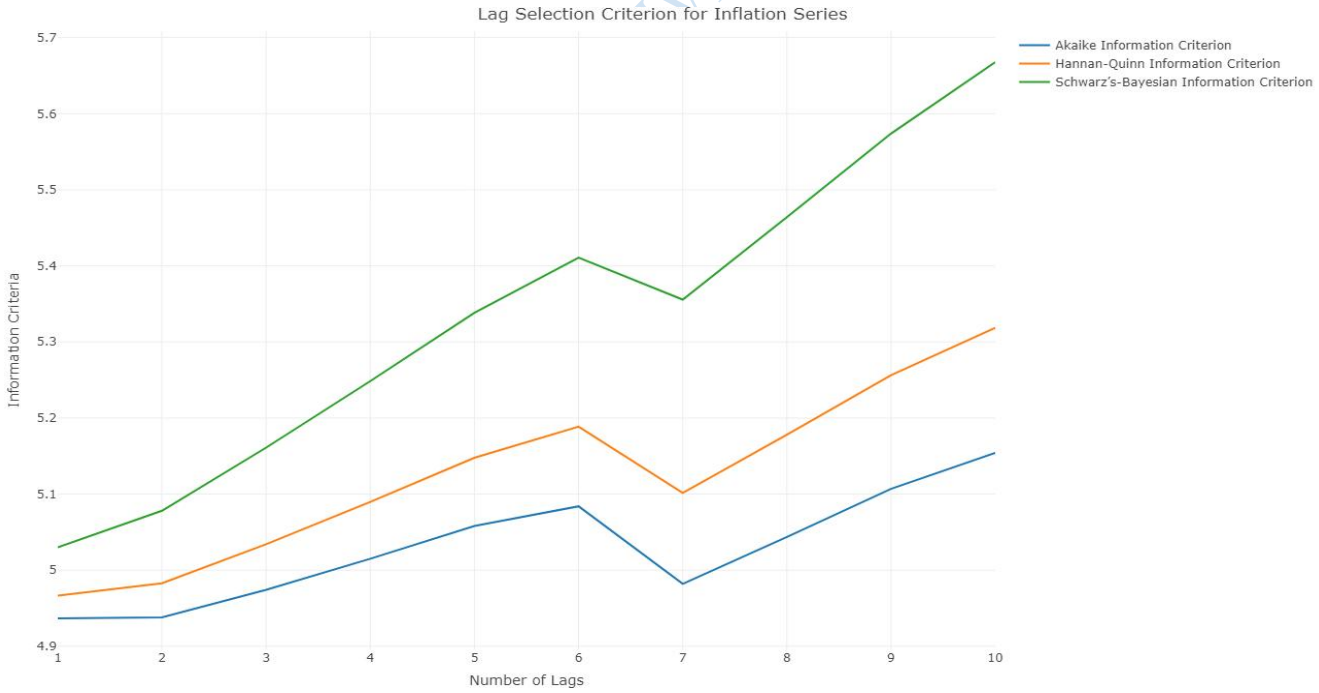
Table 4.5: Lag selection criterion for Inflation series

Inflation	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	4.937	4.938	4.974	5.015	5.058	5.084	4.982	5.044	5.107	5.154
HQ	4.966	4.983	5.034	5.09	5.148	5.189	5.101	5.178	5.256	5.318
SBIC	5.03	5.078	5.161	5.249	5.338	5.411	5.356	5.464	5.574	5.668
FPE	139.3	139.6	144.9	151.1	158.1	162.8	147.7	158	169.6	179.4

(Source: Author's computation using R version 4.1)

In Table 4.5, all the information criteria seem to agree that lag order 1 is optimal for the inflation series. They all have their lowest values at lag order 1. This is visually presented in Figure 4.5.

Figure 4.5: Lag selection Information Criterion plot for Inflation series.



(Source: Author's plot using the 'plotly' library in R version 4.1)

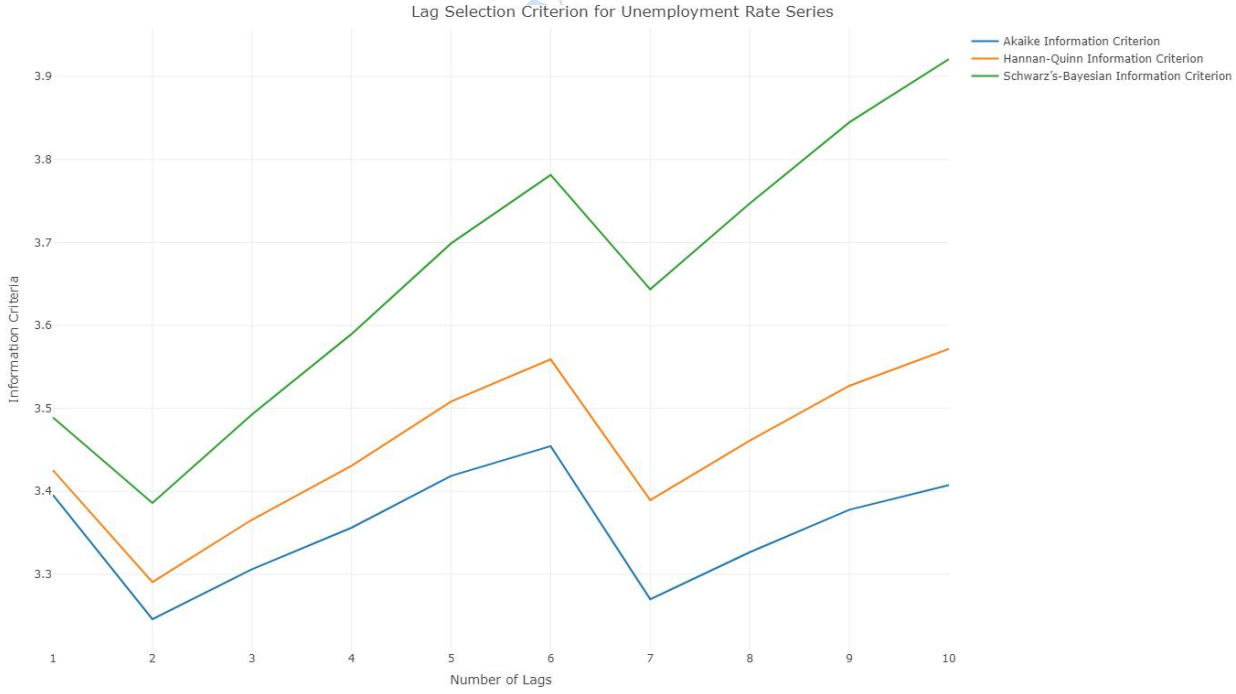
Table 4.6: Lag selection criterion for Unemployment Rate series

Unemployment Rate	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	3.396	3.246	3.306	3.356	3.419	3.454	3.27	3.327	3.378	3.407
HQ	3.426	3.291	3.366	3.431	3.508	3.559	3.389	3.461	3.527	3.572
SC	3.489	3.386	3.493	3.59	3.699	3.781	3.644	3.747	3.845	3.921
FPE	29.84	25.7	27.32	28.77	30.7	31.92	26.66	28.38	30.09	31.29

(Source: Author's computation using R version 4.1)

From Table 4.6, all the information criteria seem to agree that lag order 2 is optimal for the unemployment series. They all have their lowest values at lag order 2. This is visually presented in Figure 4.6.

Figure 4.6: Lag selection Information Criterion plot for Unemployment Rate series.



(Source: Author's plot using the 'plotly' library in R version 4.1)

This directs us to the outcome of the unit root tests which are presented in Table 4.7. The null hypothesis is that there is a unit root (in essence, non-stationarity), while the

alternative hypothesis is that the series is stationary. When the p-value is less than 0.05, we can reject the null hypothesis, and accept that the series is stationary. The results presented took into consideration intercept, trend and drift stationarity, as such, a case of stationarity implies all inclusive stationarity. GDP growth is stationary without integration supported by both the ADF and the PP tests. The ADF test indicates stationarity for the inflation series without integration, but PP test denies this discovery. However, the inflation series became stationary at the first level of differencing from both the ADF and PP tests. Furthermore, both the official exchange rate and the unemployment series were not stationary without integration, evidences from both the ADF and the PP tests. They however both became stationary at the first level of differencing, evidence also from both ADF and PP tests. In summary, the series were all stationary at the first level of difference, except for the GDP growth series which was originally stationary.

Table 4.7: Summary of Augmented Dickey Fuller and Philip Peron's Unit Root Test Result

	ADF		PP		
	Statistic	**p-value**	**Statistic**	**p-value**	**Decision**
GDP Growth, I(0)	-2.1906	0.03024**	-3.6718	0.04008**	I(0)
Official Exchange Rate, I(0)	2.5947	0.9900	-0.57917	0.9721	
I(1)	-2.7768	<0.0100**	-4.5767	0.0100**	I(1)
Inflation, I(0)	-1.954	0.04967**	-3.0791	0.1500	
I(1)	-6.5581	<0.0100**	-5.7769	0.0100**	I(1)
Unemployment Rate, I(0)	0.8819	0.8897	-3.3786	0.0745	
I(1)	-2.7995	<0.0100**	-9.8689	0.0100**	I(1)

** - Statistically significant at 5%

*(**Source**: Author's computation using R version 4.1)*

4.3 Data Analysis and Interpretation

4.3.1 The Casual Relationship between Exchange Rate and Inflation in Nigeria

This section reports the outcome of the causality relationship between exchange rate and inflation in consideration of the first objective of the study. The granger causality method was adopted for this purpose. However, there is also a need for optimal lag selection. This time, it is nor for a series but for a system containing all series under study. In this case, the inflation series and the exchange rate series. Table 4.8 presents the performance of the lags based on information criteria: Akaike Information Criterion (AIC), Schwar'z Bayesian Information Criterion (SBIC), Final Prediction Error (FPE), and the Hannan-Quinn Information Criterion (HQ).

Table 4.8: Lag Selection for Inflation and Exchange Rate

Lags	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	11.359	11.441	11.591	11.734	11.653	11.463	11.663	11.741	11.645	11.105
HQ	11.447	11.589	11.797	11.999	11.978	11.847	12.106	12.243	12.206	11.726
SC	11.642	11.913	12.251	12.583	12.69	12.689	13.078	13.344	13.437	13.086
FPE(10^5)	0.86	0.94	1.10	1.30	1.25	1.09	1.45	1.77	1.91	1.43

(Source: Author's computation using R version 4.1)

From Table 4.8, HQ, SBIC, and FPE have their lowest values at lag order 1, indicating that lag order 1 is optimal. However, the AIC contradicts the other criteria,

having its lowest at lag order 10. The best choice of lag is therefore lag order 1 since it is the lowest and three other criteria agrees to it.

Table 4.9 presents the outcomes of the granger causality tests for the relationship between exchange rate and inflation. The null hypotheses are:

- Exchange Rate does not Granger cause Inflation.
- Inflation Rate does not Granger cause Exchange Rate.

The alternative hypotheses are:

- Exchange Rate Granger causes Inflation.
- Inflation Rate Granger causes Exchange Rate.

If the p-value of the F-statistics is less than 0.05, which is the significance level, then we reject the null hypothesis. Otherwise, we accept the alternative.

Table 4.9: Granger Causality Test for the relationship between Exchange Rate and Inflation

Null-Hypotheses	F − statistic	p-value	DF	Decision
$Inflation \nRightarrow Exchange\ Rate$	0.22222	0.0388	1	Reject
$Exchange\ Rate \nRightarrow Inflation$	0.015307	0.0019	1	Reject

Note: $\nRightarrow$ denotes non-causality from left to right

(Source: Author's computation using R version 4.1)

From table 4.9, since the p-values of the relationship between exchange rate and inflation and vice versa are less than 0.05, being 0.0019 and 0.0388, we conclude that exchange rate granger cause inflation, and likewise inflation granger cause exchange rate.

Noteworthy is the fact that the causality test results are viable only when the VAR model from which the causality is tested meets the stochastic assumption requirements of traditional least squares regression[2]. Hence, the granger model must be free from autocorrelation and serial correlation.

Table 4.10: Autocorrelation Tests

Serial Correlation Test Portmanteau (asymptotic)		**Autocorrelation Test** (Lagrange Multiplier)	
Chi-squared	**p-value**	**Q-statistic**	**p-values**
35.997	0.0341	4.4677	0.0464

(Source: Author's computation using R version 4.1)

The Lagrange Multiplier (LM) test as suggested by Salisu, which hypothesizes that the residual terms of the model exhibits, no autocorrelation up to the h^{th}lag, suits the dynamic nature of the VAR model. The test result reported in Table 4.10 shows that this hypothesis is rejected for the optimal lag, implying that estimating the granger model validated autocorrelation and the result is viable. The Portmanteau Test also indicates the presence of serial correlation.

4.3.2 The extent at which exchange rate affects inflation in Nigeria

The ARDL model and its counterparts Error correction model were estimated for the purpose of investigating the short run and long run relationship between the dependent variable (inflation rate) and the set of independent variables (Exchange Rate, GDP Growth and the Unemployment rate). The estimation commenced investigating the maximum lag length of the variables using the Akaike Information Criterion and the best order for all the included variables is 2 thus the problem of over-parameterization is overcome.

ARDL Model Selection

Table 4.11: Model Selection Criterion (AIC)

Serial Number	AIC	Lag Order
1	314.3470	2,2,2,2
2	315.4988	1,2,0,0
3	317.2760	1,2,0,1
4	319.1167	1,2,1,1,
5	326.5091	1,1,1,1,

(Source: Author's computation using R version 4.1)

The first five lag orders generated from the AIC technique for the variables are shown in table 4.11 with ARDL (2,2,2,2) identified as the best underlying model for estimating inflation rate in attributed to exchange rate, GDP growth and unemployment rate.

Hence the estimated model would have the form

$$\boldsymbol{Inf_t = c_o + \sum_{i=1}^{2} \beta_{1i} Inf_{t-i} + \sum_{i=0}^{2} \beta_{2i} ExcR_{t-i} + \sum_{i=0}^{2} \beta_{3i} GDP_{t-i} + \sum_{i=0}^{2} \beta_{4i} UmpR_{t-i} + \varepsilon_t}$$

Corresponding to the Stationary model form as

$$\boldsymbol{\Delta Inf_t = \tau_0 + ECT_{t-1} + \sum_{i=1}^{2} \beta_{1i} \Delta Inf_{t-i} + \sum_{i=0}^{2} \beta_{2i} \Delta ExcR_{t-i} + \sum_{i=0}^{2} \beta_{3i} \Delta GDP_{t-i} + \sum_{i=0}^{2} \beta_{4i} \Delta UmpR_{t-i} + \varepsilon_t}$$

The second equation is made up of the error correction term (ECT_{t-1}) suggesting the investigation of the long run relationship impacts of the collective set of independent variables explaining the inflation rate in Nigeria.

Co-integration Test

Hypothesis:

H_0: $No\ Co-integration$

H_1: $There\ is\ possible\ co-integration$

Table 4.12 Bound F (Wald) Test for No Co-integration

F-Statistic	K	T	P-Value
3.6777	3	1000	0.04883

(Source: Author's computation using R version 4.1)

Table 4.12 shows the test of co-integration using the bound f test with the finding that there is possible co-integration associated with the variables under study since p-value (0.04883) > 0.05 level of significance.

Table 4.13: Bound t-Test for No Co-integration

t-Statistic	K	T	P-Value	Alpha	Lower Bound I(0)	Upper Bound I(1)
-3.9589	3	1000	0.03267	0.05	-2.86	-3.78

(Source: Author's computation using R version 4.1)

The result of bound t-test for no co-integration also concludes the presence of co-integration among the variables. Hence, we expected to have significance short run and possibly long run relationship between inflation rates and its underlined predictors in the study.

ARDL Model Parameters Estimation

Table 4.14: ARDL Parameters Estimates

Coefficients	Estimate	Std. Error	tvalue	Pr(>|t|)	
(Intercept)	26.32849	8.43925	3.120	0.00439	**
L(Inflation_consumer_prices :1)	0.76543	0.16675	4.590	9.92e-05	***
L(Inflation_consumer_prices :2)	-0.47799	0.18291	-2.613	0.01471	*
Official_exchange_rate	-0.15947	0.13829	-1.153	0.25934	
L(Official_exchange_rate :1)	0.10348	0.21168	0.489	0.62903	
L(Official_exchange_rate :2)	0.07504	0.17365	0.432	0.66919	
GDP_growth	-1.43882	0.64405	-2.234	0.03430	*
L(GDP_growth :1)	0.36067	0.61634	0.585	0.56348	
L(GDP_growth :2)	0.47669	0.56290	0.847	0.40481	
Unemployment_Rate	-0.14957	0.68123	-0.220	0.82793	
L(Unemployment_Rate :1)	-0.14056	0.71585	-0.196	0.84586	
L(Unemployment_Rate :2)	-0.66269	0.66250	-1.000	0.32639	

(Source: Author's computation using R version 4.1)

Based on the best order model identified, Table 4.14 gives the estimates of the ARDL model parameters and their corresponding standard error, t-statistics and P-values. It is found that inflation rate is only significantly predicted by its lags and the current GDP growth since their corresponding P-values are less than the level of significance ($\alpha = 0.05$). Other variables are found to have no significant impact on inflation rate.

Error Correction Model (ECM) Parameters Estimation

Table 4.15: Unrestricted Error Correction Model Parameters Estimation

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	26.32849	8.43925	3.120	0.00439	**
L(Inflation_consumer_prices :1)	-0.71256	0.17999	-3.959	0.00052	***
L(Official_exchange_rate : 1)	0.01906	0.07256	0.263	0.79486	
L(GDP_growth : 1)	-0.60147	0.60716	-0.991	0.33100	
L(Unemployment_Rate : 1)	-0.95281	1.03581	-0.920	0.36609	
d(L(Inflation_consumer_prices : 1))	0.47799	0.18291	2.613	0.01471	*
d(Official_exchange_rate)	-0.15947	0.13829	-1.153	0.25934	
d(L(Official_exchange_rate : 1))	-0.07504	0.17365	-0.432	0.66919	
d(GDP_growth)	-1.43882	0.64405	-2.234	0.03430	*
d(L(GDP_growth : 1))	-0.47669	0.56290	-0.847	0.40481	
d(Unemployment_Rate)	-0.14957	0.68123	-0.220	0.82793	
d(L(Unemployment_Rate : 1))	0.66269	0.66250	1.000	0.32639	

(Source: Author's computation using R version 4.1)

On the basis of the unrestricted error correction model for stationary series, it is discovered that Inflation rate is significantly predicted by its own lag values, its differenced lag, and the rate of change of the gross domestic product growth just as

the ARDL succinctly implies the relationship involved since their P-values are not greater than 0.05.

Table 4.16: Restricted Error Correction Model Parameters Estimation

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)	
d(L(Inflation_consumer_prices :1))	0.47799	0.16087	2.971	0.00579	**
d(Official_exchange_rate)	-0.15947	0.11290	-1.412	0.16810	
d(L(Official_exchange_rate : 1))	-0.07504	0.13131	-0.571	0.57193	
d(GDP_growth)	-1.43882	0.51606	-2.788	0.00911	**
d(L(GDP_growth : 1))	-0.47669	0.49917	-0.955	0.34723	
d(Unemployment_Rate)	-0.14957	0.56043	-0.267	0.79138	
d(L(Unemployment_Rate : 1))	0.66269	0.54627	1.213	0.23456	
ect	-0.71256	0.15470	-4.606	7.07e-05	***

(Source: Author's computation using R version 4.1)

In other to reveal the impact of the long run relationship of inflation rates attributed to the set of observed independent variables, Table 4.16 gives the estimate of restricted error correction model with the inclusion of the error correction term found to be statistically significantly thus suggesting the presence of long run impact of the combined independent variables on the inflation rate. The only significantly variable provided the model is the rate of change of GDP which implies that if the rate of change of GDP increase by 1 unit of interest there would be corresponding decrease

of 1.43882 in the percent change in the unit of inflation rate and if citeris paribus, percent change in inflation rate would remain as 0.47799.

Models' Summary

Table 4.17: Model Summary

Model	R^2	R^2_{Adj}	$F-Statistic$	$df_1; df_2$	$P-Value$
ARDL	0.5982	0.4282	3.518	11;26	0.004065
UECM	0.476	0.2543	2.147	11;26	0.05349
RECM	0.4761	0.3364	3.408	8;30	0.006684

(Source: Author's computation using R version 4.1)

The model summary is given by Table 4.17. Finding established that the ARDL and the RECM are significant models in predicting inflation rates in Nigeria as depict the P-values respectively. More than fifty-nine percent (59.982%) and 47.61% of the total variation in inflation rates are being explained by the ARDL and Error correction model respectively. The best model as suggested the adjusted R square is the ARDL model with highest computed value as $R^2_{Adj} = 42.82$ as compared to other model with smaller adjusted R squares. Though, RECM seems to be better than the UECM as a result of the incorporated estimated significant error correction term.

Multiplier Determination

Table 4.18: Short Run Impact

	Term	Estimate	Std. Error	t-Statistic	P-Value
1	(Intercept)	36.9490961	6.84414563	5.3986426	1.177193e-05
2	Official exchange rate	-0.2237938	0.09946624	-2.2499477	3.313933e-02
3	GDP growth	-2.0192198	0.88827703	-2.2731870	3.151331e-02
4	Unemployment Rate	-0.2099059	1.31474015	-0.1596558	8.743861e-01

(Source: Author's computation using R version 4.1)

Hypothesis:

H_0: There is no short run relationship versus H_1: There is short run relationship.

The set of independent variables investigated have a significant short run relationship with inflation rate as seen in Table 4.18. All are having very small P-Values.

Table 4.19: Long Run Impact

	Term	Estimate	Std. Error	t-Statistic	P-Value
1	(Intercept)	36.94909610	6.84414563	5.3986426	1.177193e-05
2	Official exchange rate	0.02675078	0.09946624	0.2689433	7.900960e-01
3	GDP growth	-0.84409055	0.88827703	-0.9502560	3.507325e-01
4	Unemployment Rate	-1.33716882	1.31474015	-1.0170594	3.184966e-01

(Source: Author's computation using R version 4.1)

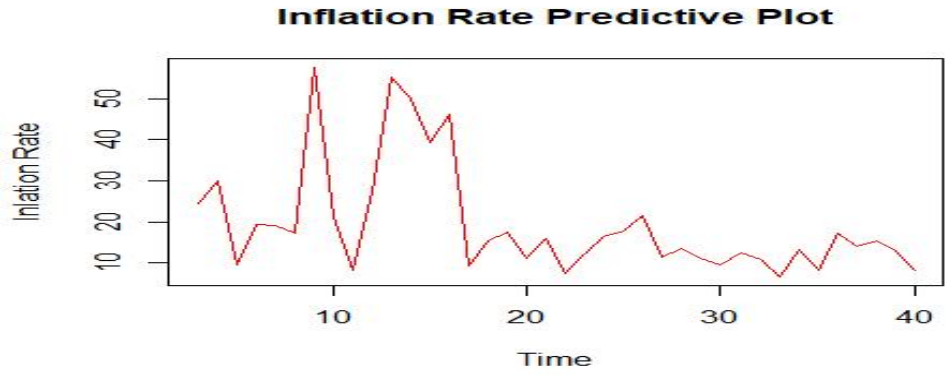
Hypothesis:

H_0: There is no short run relationship versus H_1: There is short run relationship.

The set of independent variables investigated have a significant long run relationship with inflation rate as seen in table 4.19 with all having very small P-Values.

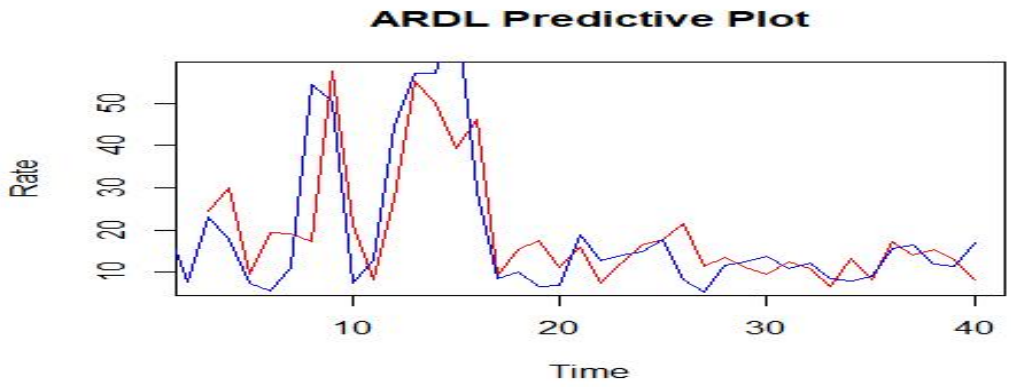
Predictive Analysis

Figure 4.7: The ARDL predictive plot for the estimated inflation rate.



(Source: Author's computation using R version 4.1)

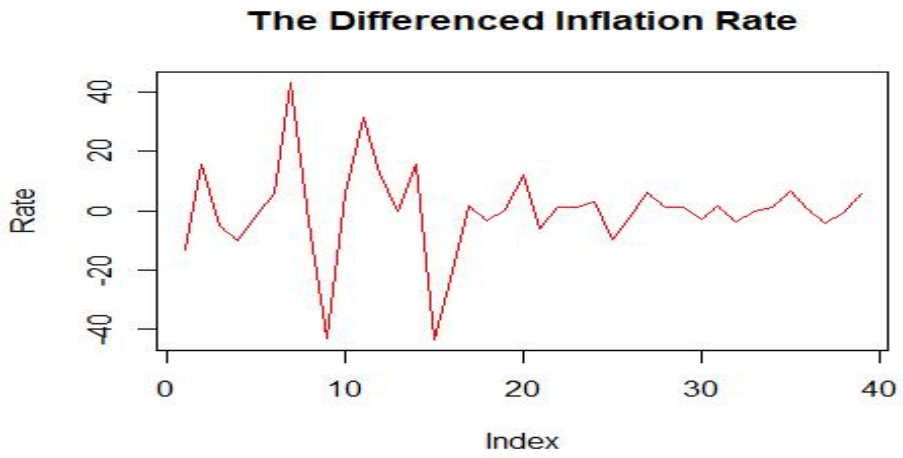
Figure 4.8: Predictive-Actual Inflation Rate Plot



(Source: Author's computation using R version 4.1)

Figure 4.8 shows the co-movement of the actual inflation rate and the predictive/fitted values. The super-imposition of both is shown with distinct discrepancy indicating some noticeable amount of residuals whose serial correlation trait should be investigated in the long run.

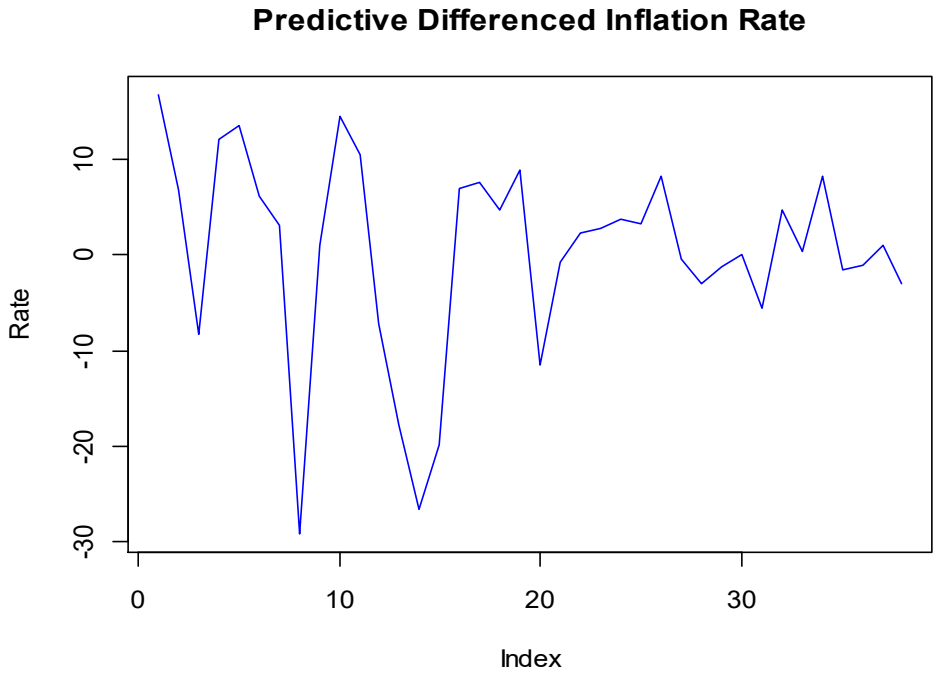
Figure 4.9: The Differenced Inflation Rate Series



(Source: Author's computation using R version 4.1)

The differenced series shows the trait of stationarity in the long run.

Figure 4.10: Predictive Differenced Inflation Rate



(Source: Author's computation using R version 4.1)

The predictive differenced inflation rate is that obtained from the RECM fitted model though having little variation from the actual differenced since the R square has a percentage less 50%

Model Forecast Accuracy

Table 4.20: Forecast Accuracy

Model	ME	RMSE	MAE	MPE	MAPE	MASE
ARDL	2.332747e-17	10.7521	6.985264	-25.5712	47.92509	0.8077328
UECM	-1.518568e-16	10.7521	6.985264	-57.19086	338.154	0.498356
RECM		10.7521	6.985264	-57.19086	338.154	0.7935167

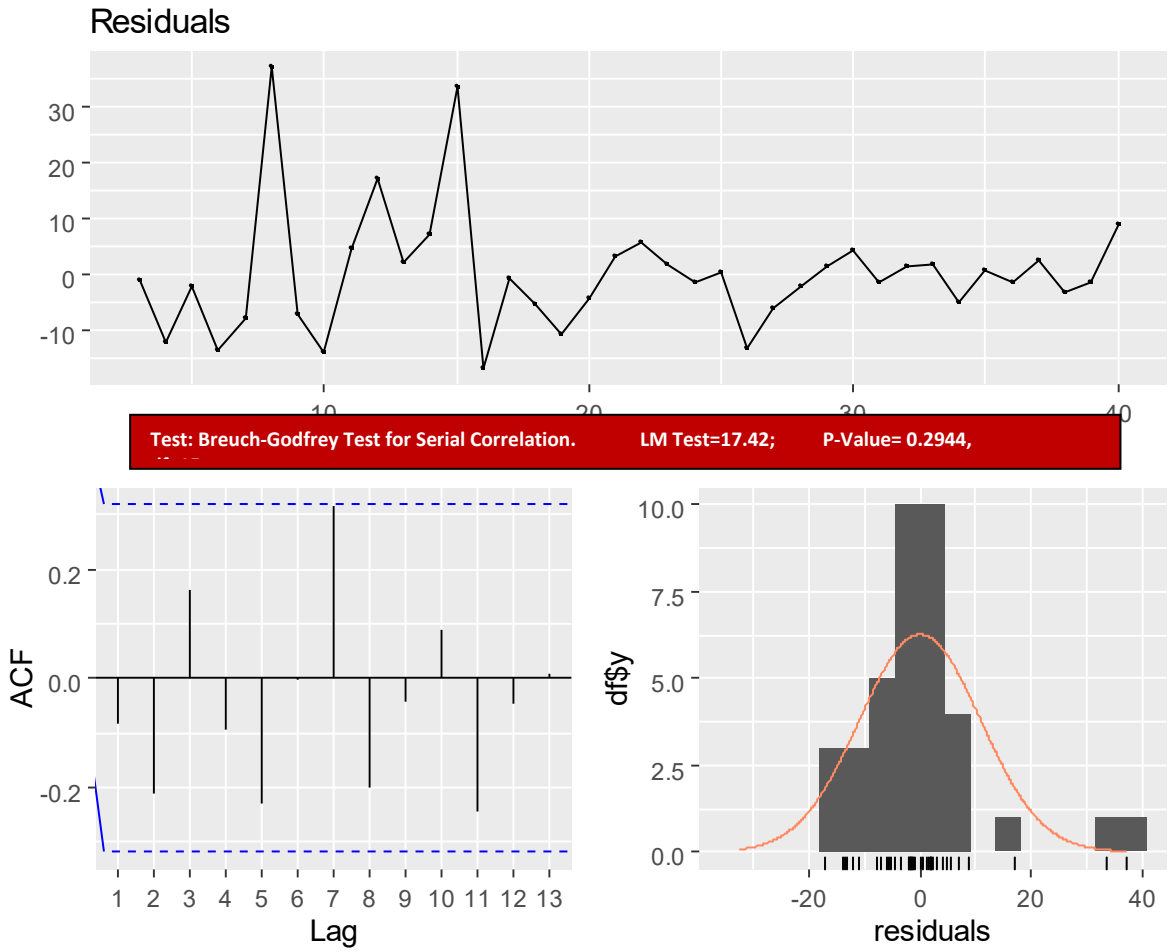
2.863663e-16

(Source: Author's computation using R version 4.1)

The accuracy of the model is accounted for by table 4.20. Result shows that the Root mean squared error for the three models as well as mean absolute error are the same. Considering the mean absolute percentage error, the ARDL seems best for modeling inflation rate having the lowest value.

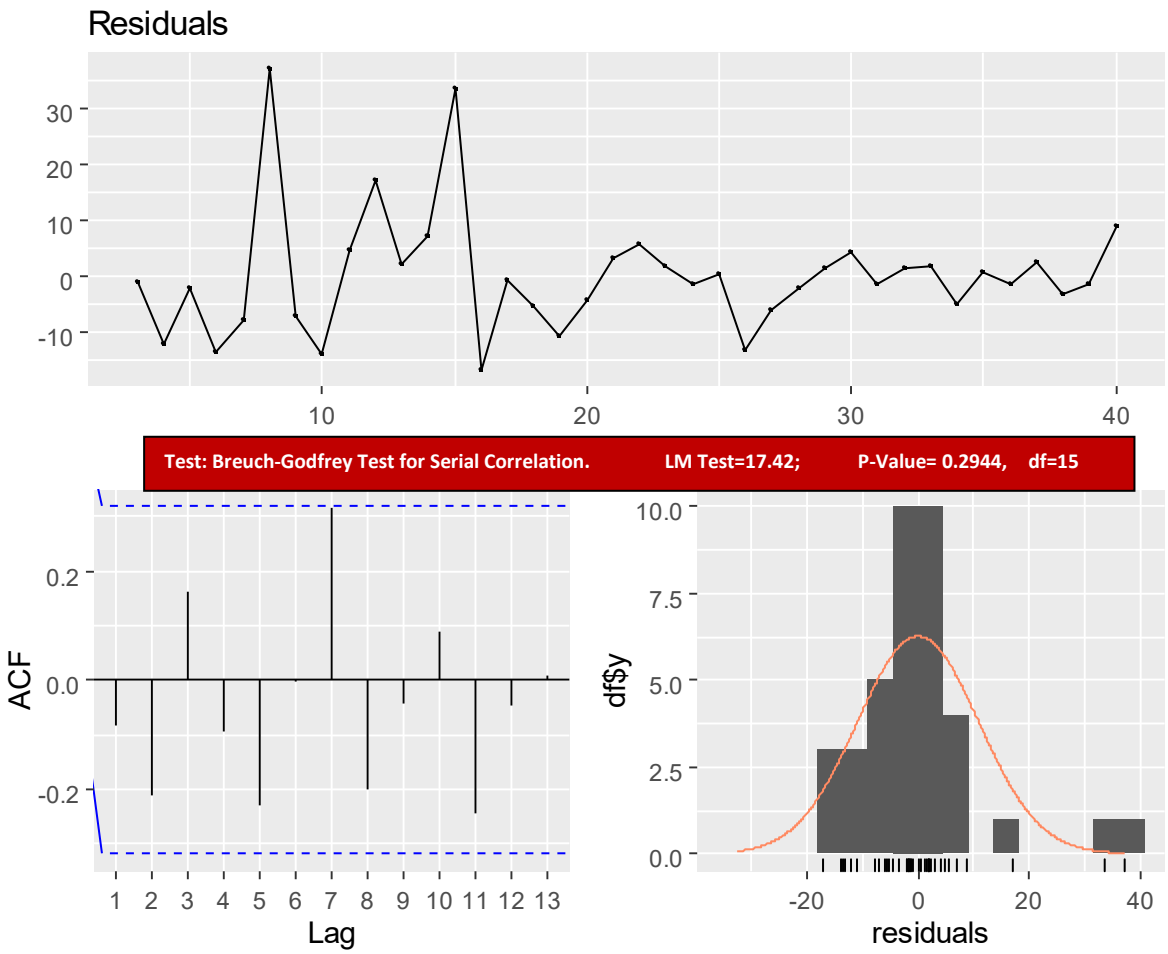
Residual Diagnostics

Figure 4.11: ARDL Model

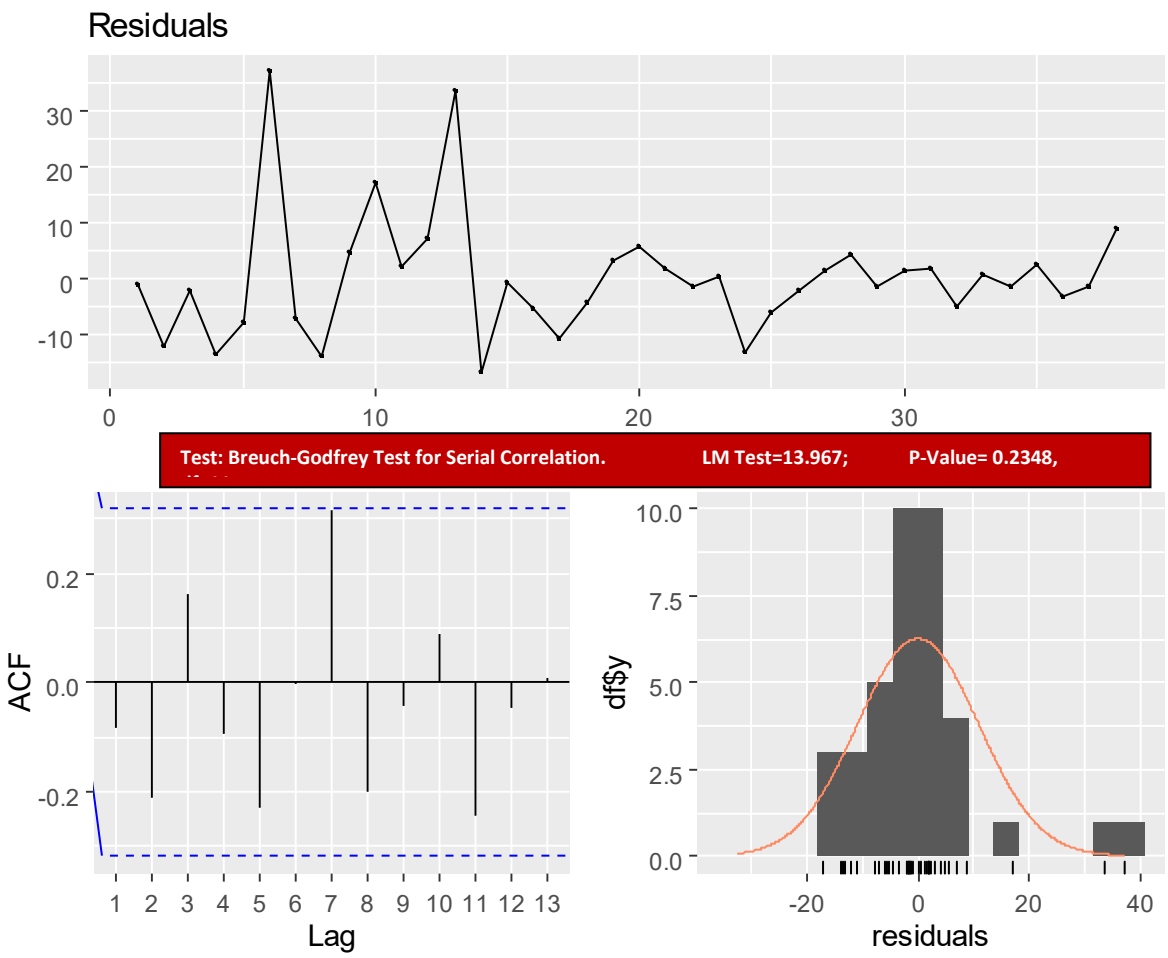


(Source: Author's computation using R version 4.1)

Figure 4.12: RECM Model



(Source: Author's computation using R version 4.1)



(Source: Author's computation using R version 4.1)

From the estimated result of the Breuch-Godfrey Test of serial correlation, it is found that the estimated residuals are serially correlated with P-Values > 0.05 level of significance.

4.3.3 Causal effects of other major Macroeconomic variables on inflation in Nigeria

Table 4.21: Lag selection criterion for inflation and other macroeconomic variables

Criterion	Number of Lags							
	1	2	3	4	5	6	7	8
AIC	10.83	11.14	11.382	11.508	11.622	10.963	10.801	9.756
HQ	11.01	11.45	11.825	12.084	12.331	11.805	11.775	10.864
SBIC	11.39	12.12	12.796	13.346	13.885	13.650	13.912	13.292
FPE (10^3)	50.65	70.57	95.82	122.18	168.84	125.20	200.17	240.81

(Source: Author's computation using R version 4.1)

Optimal lag selection is order 1, evidence from FPE and SBIC in table 4.21. Although, HQ and AIC is indicating lag order 8, we still choose the lowest, which is lag order 1.

Table 4.22: Granger Causality Test for the relationship between other macroeconomic variables and Inflation in Nigeria

Null-Hypotheses	F − statistic	p-value	DF	Decision
$Inflation \nRightarrow GDP$	0.4383	0.0123	1	Reject
$GDP \nRightarrow Inflation$	1e-04	0.0033	1	Reject
$Inflation \nRightarrow Unemployment\ Rate$	0.0099	0.0211	1	Reject
$Unemployment\ Rate \nRightarrow Inflation$	0.2214	0.0409	1	Reject

Note:⇏denotes non-causality from left to right

(Source: Author's computation using R version 4.1)

From table 4.21, since the p-values of the relationship between GDP growth and inflation, and vice versa are less than 0.05, being 0.0033 and 0.0123, we conclude that GDP growth granger cause inflation, also inflation granger cause GDP growth. The same thing with unemployment rate and inflation. There was granger causality both ways. However, the result of the LM autocorrelation test and serial correlation is presented in table 4.22.

Table 4.22: Autocorrelation Tests for inflation and other macroeconomic variables

Serial Correlation Test Portmanteau (asymptotic)		**Autocorrelation Test** (Lagrange Multiplier)	
Chi-squared	**p-value**	**Q-statistic**	**p-values**
94.03	0.0071	6.4339	0.6958

(Source: Author's computation using R version 4.1)

The test result reported in table 4.22 shows that this hypothesis is rejected for the optimal lag. The Portmanteau test also indicates the present of Serial Correlation.

4.4 Discussion of Findings

4.4.1The Casual Relationship between Exchange Rate and Inflation in Nigeria

Apparently, from the results of the granger model between exchange rate and inflation, there is evidence of causality in both directions between the two variables. The decision is a clear cut one as the p-values are significantly lower than the critical level. However, this information seems to be a consistent to some earlier studies.

Several studies looked rather into the relationship between exchange rate and variables that could influence inflation in African countries including Nigeria. Some examples include studied that have found that exchange rates and inflation had a

two-way causal relationship in Zimbabwe[3]. This was also corroborated by another study whichshows that appreciation of domestic currency leads to a decline in inflation in 14 OECD countries[4]. Others have also found that money supply growth depreciates domestic currency and increases inflation in Cambodia[5]. Specifically, the result of investigation carried out by a scholar on the relationship between nominal exchange rate volatility and dollarization in Nigeria by applying Granger Causality Test and found a bidirectional causality. The outcome of our study complements these findings as there is evidence of causality between exchange rate and inflation for Nigeria[6].

4.6.2. The extent at which exchange rate affects inflation in Nigeria

The result of the Autoregressive Distributed Lags (ARDL) co-integration technique implied that there is co-integration relationship between official exchange rate and inflation in Nigeria. This aligns with the discoveries of many studies conducted earlier. Some scholars have observed that money supply and exchange rates have a significant long-run effect on inflation in Nigeria[7]. Whereas, in Zimbabwe, it was found that exchange rates and inflation had a long-run bidirectional causal relationship while in Egyptstudies found that the extent of the exchange rate through to inflation is substantial, albeit incomplete[8,9]. In Tanzania, however, researchersfound a significant relationship between exchange rates and inflation, and that money supply cause inflationary spiral and exchange rate variations in the short and long runs[10,11].

However, the results from our study contradicts the findings of a scholar who found that the official exchange rate could not exert any significant influence on inflation but a significant positive relationship was found between the parallel exchange rate and the general price level[12]. The conclusion from this section and section 4.6.1 are mostly agreement that official exchange rate behaves differently from the real

exchange rate and the parallel price. Meanwhile, other researchers highlighted that prices, parallel rate, and lending rate were found to be important sources of perturbations in the official exchange rate[13].

4.6.3. Causal Effects of other Major Macroeconomic Variables on Inflation in Nigeria

It was found in a study that examined the exchange rate and macroeconomic aggregates in Nigeria that there is no evidence of a strong direction between changes in the exchange rate and GDP growth[14]. Specifically considering the effect of some macroeconomic variables, it was stated by some scholars that output and parallel rate were important determinants of inflation dynamics in African nations, it was further found that there exist a causal relationships between money supply and inflation rate whereby money supply increases inflationary pressure in the short and long runs[15]. In addition to the macroeconomic variables considered with respect to inflation, but particularly in Nigeria, our study reveals that there is granger causality relationship between GDP growth and inflation, likewise between unemployment rate and inflation.

End Notes

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Chapter Five

Conclusions

This chapter contains the summary of key findings made by the study, the conclusion arrived at based on the findings, policy recommendations towards micro and macroeconomic policy management on exchange rate and inflation in Nigeria, and also raises points of consideration for future research.

5.1 Summary of Findings

The study was conducted to examine the effect of exchange rate on inflation in Nigeria. It specifically sought to uncover the casual relationship between exchange rate and inflation in Nigeria. In addition, the study sought to determine the extent at which exchange rate affects inflation and examine the major macroeconomic variables (i.e., economic growth and unemployment) that cause inflation in Nigeria economy. The study utilized time series data from 1981 to 2020 and performed Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) unit root tests to determine the nature of stationarity of the variables used. In other to test the stated hypotheses of the study, a Granger Causality Test with an exogenous variable as well as ARDL model were estimated. The empirical results of the study can be summarized as follows:

a) The results of the unit root tests indicate that the inflation series became stationary at the first level of differencing from both the ADF and PP tests. Furthermore, both the official exchange rate and the unemployment series were not stationary without integration, evidences from both the ADF and the PP tests. They however both became stationary at the first level of differencing, evidence also from both ADF and PP tests. In summary, the

series were all stationary at the first level of difference, except for the GDP growth series which was originally stationary.

b) The Granger causality tests revealed that, there is evidence of causality in both directions between the two variables. The decision is a clear cut one as the p-values are significantly lower than the critical level. However, this information seems to be a validating some earlier studies. A viable justification to this consistence may be because of a wider scope of coverage with respect to the period studied.

c) Corroborating the causality tests, findings from the estimated Autoregressive Distributed Lags (ARDL) model showed that co-integration technique implied that there is possible co-integration associated with the variables under study since p- value (0.04883) > 0.05 level of significance. This is also corroborated to the discoveries of many studies conducted earlier. But it contradicted with Chhibber's outcome from a Ghanaian study. The study found that the official exchange rate could not exert any significant influence on inflation. The result of bound t-test for no co-integration also concludes the presence of co-integration among the variables. Hence, we expected to have significance short run and possibly long run relationship between inflation rates and its underlined predictors in the study. The error correction term found to be statistically significantly thus suggesting the presence of long run impact of the combined independent variables on the inflation rate. The only significantly variable provided the model is the rate of change of GDP which implies that if the rate of change of GDP increase by 1 unit of interest there would be corresponding decrease of 1.43882 in the percent change in the unit

of inflation rate and if ceteris paribus, percent change in inflation rate would remain as 0.47799.

The set of independent variables investigated have a significant short run relationship with inflation rate. All are having very small p-values. Similarly, the set of independent variables investigated have a significant long run relationship with inflation rate with all having very small p-values.

d) The causal effects of other major macroeconomic variables on inflation in Nigeria revealed that there is no granger causality relationship between GDP growth and inflation, likewise between unemployment rate and inflation.

5.2 Conclusion

Assessing link between exchange rate, inflation rate and other macroeconomic variables is very essential because the understanding of the relationship between these variables are prerequisite for adoption of inflation targeting as a monetary policy strategy which the government of Nigeria has made an objective in the attainment of its macroeconomic objectives. Exchange rateexchange has to be right since it has a meaningful price that impacts on other prices. Where the volatility of rate of exchange persists, things will be counterproductive in actualizing the goal of price stability. It impacts on inflation, money growth, income and rate of exchange which its movement has remained the focal issue when examining the long term causes of inflation in an economy.

Based on the empirical evidence of the study, it can be concluded that the official exchange rate could not impact any significant influence on inflation rate. The conclusion from this study is mostly agreement that official exchange rate behaves differently from the real exchange rate and the parallel price. Furthermore, exchange

rate has no significant influence on inflation, but the first lag of inflation was found to be significant to its present value.There is no granger causality relationship between other major macroeconomic variables and inflation. Also, the study concludes that the official exchange rate could not effect any significant influence on inflation rate.

5.3 Recommendations

The Nigerian economic system for instance, a big problem that has always been at the fore is the astronomical inflationary trend and devaluation in the value of naira. The inflationary trend within the country has been a source of concern and this has had some unprecedented effect on the economic growth, import and export growth, growth of money supply, rate of exchange volatility and a general macroeconomic instability. In view of the realities of casual relationship between the official exchange rate and inflation in Nigeria, the following policy measures are recommended:

a) The government should make the economic investment friendly by fixing in place political stability, security of lives and good economic climate to draw home foreign investors to boost the nation's productivity. This may also reduce capital flight plaguing the country.

b) Efforts should be intensified to extend the volume of non-oil export to make up for the extra demand for foreign exchange that may be created by the depreciation of Naira.

c) The government should intensify more efforts on economic reforms i.e., Small and Medium Enterprises Equity Investment Scheme (SMEEIS) et al. as this will enhance and promote the production of local goods, reduce pressure on imported goods which can automatically reduce the demand for the dollar. this is able to lead to a favorable exchange rate for the country.

5.4 Contribution to Knowledge

Much emphasis has been laid in the literature on the relationship between exchange rate and inflation with no consensus on the nature of causality existing between both. Several studies looked rather into the relationship between exchange rate and variables that could influence inflation in Nigeria. Inflation being a common manifestation of economic instabilityis usually associated with prices and pricing which leads to a disequilibrium between effective purchasing power and available output of goods and services. In addition to the above, the frequent fiscal deficit operation in the last two decades in which budget deficit is financed through banks has further exerted upward pressure on the general price level. This suggests that the current inflation may have been caused by these factors. While the channels through which exchange rate depreciation affect prices are well known, the extent to which this phenomenon engenders price inflation in Nigeria is one of the justifications for the study.This study has contributed to existing knowledge by investigating the existence of asymmetries in the effect of exchange rate on inflation. The findings showed evidence of asymmetry in the effect of exchange rate on inflation and established that official exchange rate could not significanttly influence on inflation in the Nigeria case.

5.6 Suggestion for Further Research

The adoption of real exchange rate and parallel rates rather than official exchange rate identified with the study provides ample justification for further research into the exchange rate and inflation rate nexus. Thus, adoption of real exchange rate and the parallel price data (e.g., monthly or quarterly) as the variables used would provide distinctive data that would improve inferential quality and therefore, better aid the policymaking process.

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Appendix

Appendix 1: Descriptive Statistics

Table 4.1: Summary Statistics for the Variables

	GDP growth	Official Exchange Rate	Inflation	Unemployment Rate
Observations	40	40	40	40
NAs/Missing Obs.	0	0	0	0
Minimum	-13.1279	0.617708	5.388008	1.8
Maximum	15.32916	358.8108	72.8355	30.4
1st Quartile	0.284001	9.44169	8.516362	4.25
3rd Quartile	6.47667	151.1888	18.11603	13.9
Mean	3.026325	100.7601	19.0928	10.625
Median	3.698025	106.4643	12.71577	10.05
Standard deviation	5.453163	100.7283	16.84608	7.546429
Skewness	-0.77126	0.855599	1.747208	0.76118
Kurtosis	1.279501	-0.15309	1.890981	-0.43256
Jacque-Bera	8.0374	5.2655	29.626	4.3167
Probability Value	0.01798	0.07188	3.688e-07	0.1155

Appendix 2: Correlation Matrix for the Variables

	GDP growth	Official Exchange Rate	Inflation	Unemployment Rate
GDP growth	1	0.1661	-0.2125	0.2690
Official Exchange Rate	0.1661	1	-0.3276	0.8487
Inflation	-0.2125	-0.3276	1	-0.3927
Unemployment Rate	0.2690	0.8487	-0.3927	1

Appendix 3:Lag selection criteria for Variables

Lag selection criteria for GDP Growth series

GDP Growth	**Number of Lags**									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	2.563	2.507	2.494	2.512	2.54	2.564	2.591	2.59	2.645	2.655
HQ	2.593	2.552	2.553	2.587	2.629	2.669	2.711	2.724	2.794	2.819
SBIC	2.656	2.647	2.68	2.746	2.82	2.891	2.965	3.01	3.112	3.169
FPE	12.97	12.28	12.12	12.37	12.75	13.1	13.52	13.58	14.46	14.74

Lag selection criteria for Exchange Rate series

Exchange Rate	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	6.112	6.153	6.164	6.225	6.289	6.355	6.42	6.487	6.541	6.492
HQ	6.142	6.198	6.224	6.299	6.379	6.459	6.54	6.621	6.69	6.656
SBIC	6.205	6.293	6.351	6.458	6.569	6.682	6.794	6.907	7.008	7.006
FPE	451.3	470.4	476.2	506.6	541.7	580.3	622.2	668.9	711.2	683.9

Lag selection criterion for Inflation series

Inflation	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	4.937	4.938	4.974	5.015	5.058	5.084	4.982	5.044	5.107	5.154
HQ	4.966	4.983	5.034	5.09	5.148	5.189	5.101	5.178	5.256	5.318
SBIC	5.03	5.078	5.161	5.249	5.338	5.411	5.356	5.464	5.574	5.668
FPE	139.3	139.6	144.9	151.1	158.1	162.8	147.7	158	169.6	179.4

Lag selection criterion for Unemployment Rate series

Unemployment Rate	Number of Lags									
Criterion	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	3.396	3.246	3.306	3.356	3.419	3.454	3.27	3.327	3.378	3.407
HQ	3.426	3.291	3.366	3.431	3.508	3.559	3.389	3.461	3.527	3.572
SC	3.489	3.386	3.493	3.59	3.699	3.781	3.644	3.747	3.845	3.921
FPE	29.84	25.7	27.32	28.77	30.7	31.92	26.66	28.38	30.09	31.29

Lag Selection for Inflation and Exchange Rate

Lags	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	11.359	11.441	11.591	11.734	11.653	11.463	11.663	11.741	11.645	11.105
HQ	11.447	11.589	11.797	11.999	11.978	11.847	12.106	12.243	12.206	11.726
SC	11.642	11.913	12.251	12.583	12.69	12.689	13.078	13.344	13.437	13.086
FPE(10^5)	0.86	0.94	1.10	1.30	1.25	1.09	1.45	1.77	1.91	1.43

Appendix 4:Summary of Augmented Dickey Fuller and Philip Peron's Unit Root Test Result

	ADF		PP		Decision
	Statistic	**p-value**	**Statistic**	**p-value**	
GDP Growth, I(0)	-2.1906	0.03024**	-3.6718	0.04008**	I(0)
Official Exchange Rate, I(0)	2.5947	0.9900	-0.57917	0.9721	
I(1)	-2.7768	<0.0100**	-4.5767	0.0100**	I(1)
Inflation, I(0)	-1.954	0.04967**	-3.0791	0.1500	
I(1)	-6.5581	<0.0100**	-5.7769	0.0100**	I(1)
Unemployment Rate, I(0)	0.8819	0.8897	-3.3786	0.0745	
I(1)	-2.7995	<0.0100**	-9.8689	0.0100**	I(1)

Appendix 5:Granger Causality Test for the relationship between Exchange Rate and Inflation

Null-Hypotheses	F − statistic	p-value	DF	Decision
$Inflation \nRightarrow Exchange\ Rate$	0.22222	0.0388	1	Reject
$Exchange\ Rate \nRightarrow Inflation$	0.015307	0.0019	1	Reject

Note:$\nRightarrow$denotes non-causality from left to right

(Source: Author's computation using R version 4.1)

Appendix 6: Autocorrelation Tests

Serial Correlation Test Portmanteau (asymptotic)		**Autocorrelation Test** (Lagrange Multiplier)	
Chi-squared	**p-value**	**Q-statistic**	**p-values**
35.997	0.0341	4.4677	0.0464

Appendix 7: Lag Selection

Serial Number	**AIC**	**Lag Order**
1	314.3470	2,2,2,2
2	315.4988	1,2,0,0
3	317.2760	1,2,0,1
4	319.1167	1,2,1,1,
5	326.5091	1,1,1,1,

Appendix 8: ARDL Parameters Estimates

Coefficients	Estimate	Std. Error	tvalue	Pr(>|t|)	
(Intercept)	26.32849	8.43925	3.120	0.00439	**
L(Inflation_consumer_prices :1)	0.76543	0.16675	4.590	9.92e-05	***
L(Inflation_consumer_prices :2)	-0.47799	0.18291	-2.613	0.01471	*
Official_exchange_rate	-0.15947	0.13829	-1.153	0.25934	
L(Official_exchange_rate :1)	0.10348	0.21168	0.489	0.62903	
L(Official_exchange_rate :2)	0.07504	0.17365	0.432	0.66919	
GDP_growth	-1.43882	0.64405	-2.234	0.03430	*
L(GDP_growth :1)	0.36067	0.61634	0.585	0.56348	
L(GDP_growth :2)	0.47669	0.56290	0.847	0.40481	
Unemployment_Rate	-0.14957	0.68123	-0.220	0.82793	
L(Unemployment_Rate :1)	-0.14056	0.71585	-0.196	0.84586	
L(Unemployment_Rate :2)	-0.66269	0.66250	-1.000	0.32639	

Appendix 9: Unrestricted Error Correction Model Parameters Estimation

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	26.32849	8.43925	3.120	0.00439	**
L(Inflation_consumer_prices :1)	-0.71256	0.17999	-3.959	0.00052	***
L(Official_exchange_rate : 1)	0.01906	0.07256	0.263	0.79486	
L(GDP_growth : 1)	-0.60147	0.60716	-0.991	0.33100	
L(Unemployment_Rate : 1)	-0.95281	1.03581	-0.920	0.36609	
d(L(Inflation_consumer_prices : 1))	0.47799	0.18291	2.613	0.01471	*
d(Official_exchange_rate)	-0.15947	0.13829	-1.153	0.25934	
d(L(Official_exchange_rate : 1))	-0.07504	0.17365	-0.432	0.66919	
d(GDP_growth)	-1.43882	0.64405	-2.234	0.03430	*
d(L(GDP_growth : 1))	-0.47669	0.56290	-0.847	0.40481	
d(Unemployment_Rate)	-0.14957	0.68123	-0.220	0.82793	
d(L(Unemployment_Rate : 1))	0.66269	0.66250	1.000	0.32639	

Appendix 10: Restricted Error Correction Model Parameters Estimation

Coefficients	Estimate	Std. Error	t value	Pr(>|t|)	
d(L(Inflation_consumer_prices :1))	0.47799	0.16087	2.971	0.00579	**
d(Official_exchange_rate)	-0.15947	0.11290	-1.412	0.16810	
d(L(Official_exchange_rate : 1))	-0.07504	0.13131	-0.571	0.57193	
d(GDP_growth)	-1.43882	0.51606	-2.788	0.00911	**
d(L(GDP_growth : 1))	-0.47669	0.49917	-0.955	0.34723	
d(Unemployment_Rate)	-0.14957	0.56043	-0.267	0.79138	
d(L(Unemployment_Rate : 1))	0.66269	0.54627	1.213	0.23456	
ect	-0.71256	0.15470	-4.606	7.07e-05	***

Appendix 11: Short Run Impact

	Term	Estimate	Std. Error	t-Statistic	P-Value
1	(Intercept)	36.9490961	6.84414563	5.3986426	1.177193e-05
2	Official exchange rate	-0.2237938	0.09946624	-2.2499477	3.313933e-02
3	GDP growth	-2.0192198	0.88827703	-2.2731870	3.151331e-02
4	Unemployment Rate	-0.2099059	1.31474015	-0.1596558	8.743861e-01

Appendix 12: Long Run Impact

	Term	Estimate	Std. Error	t-Statistic	P-Value
1	(Intercept)	36.94909610	6.84414563	5.3986426	1.177193e-05
2	Official exchange rate	0.02675078	0.09946624	0.2689433	7.900960e-01
3	GDP growth	-0.84409055	0.88827703	-0.9502560	3.507325e-01
4	Unemployment Rate	-1.33716882	1.31474015	-1.0170594	3.184966e-01

Appendix 13: Residual Diagnostics

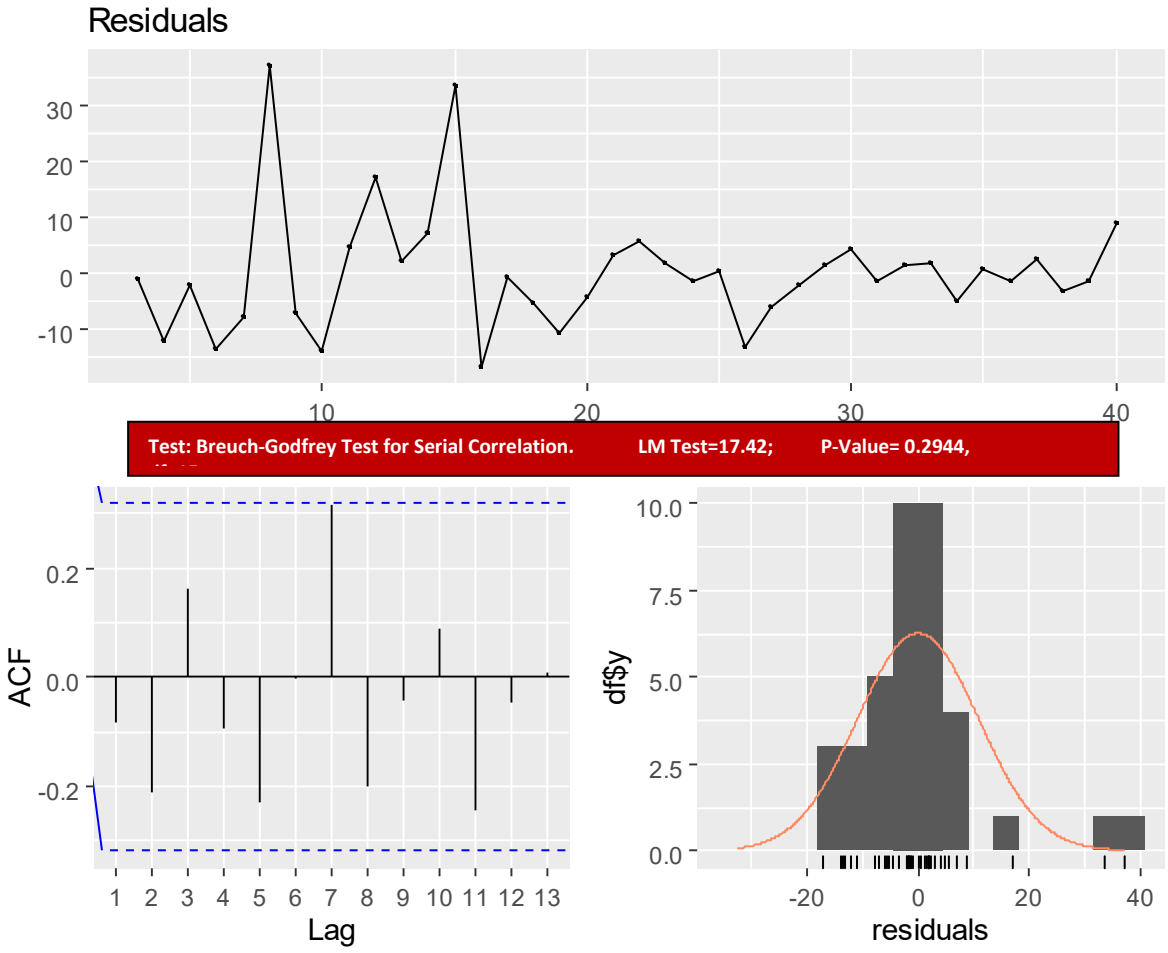


Figure 4.11: ARDL Model

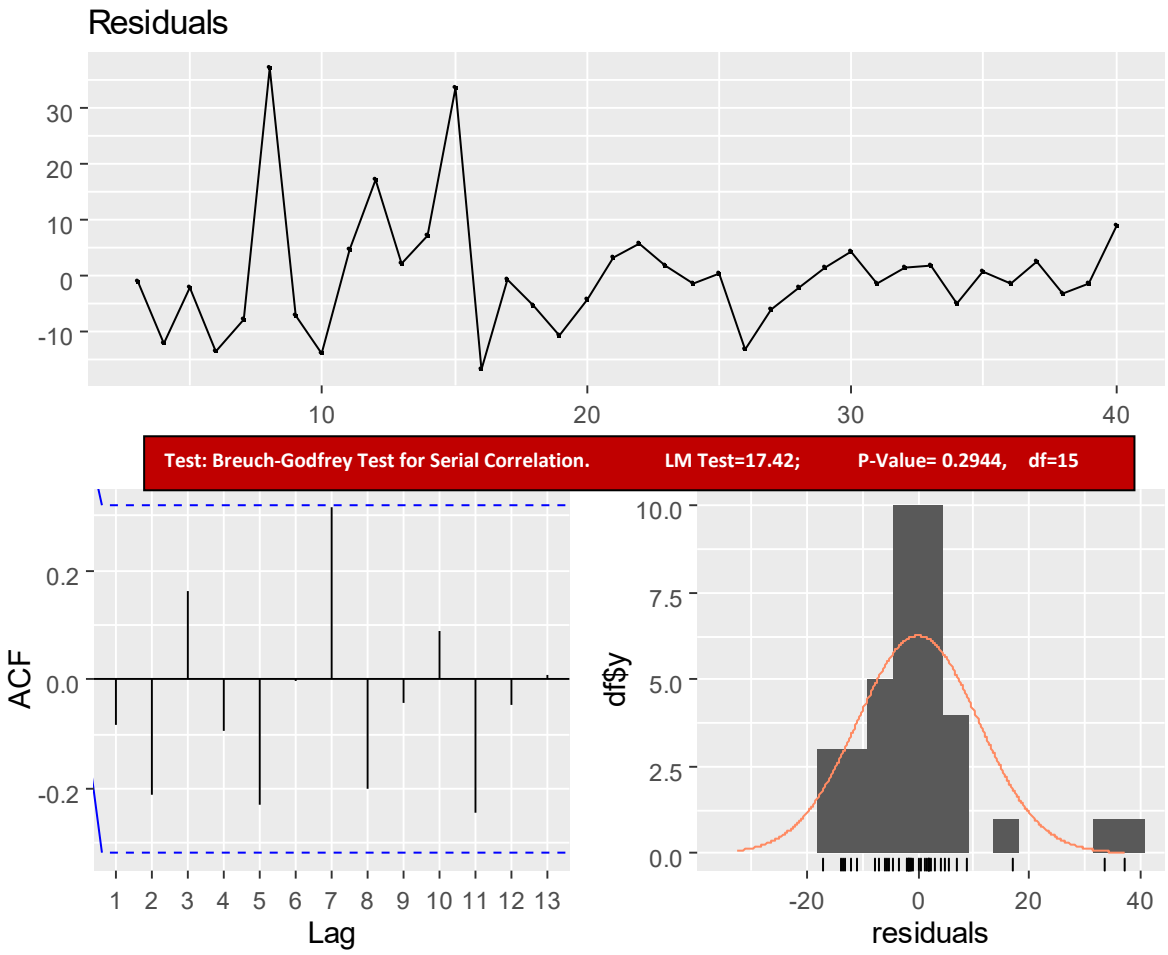
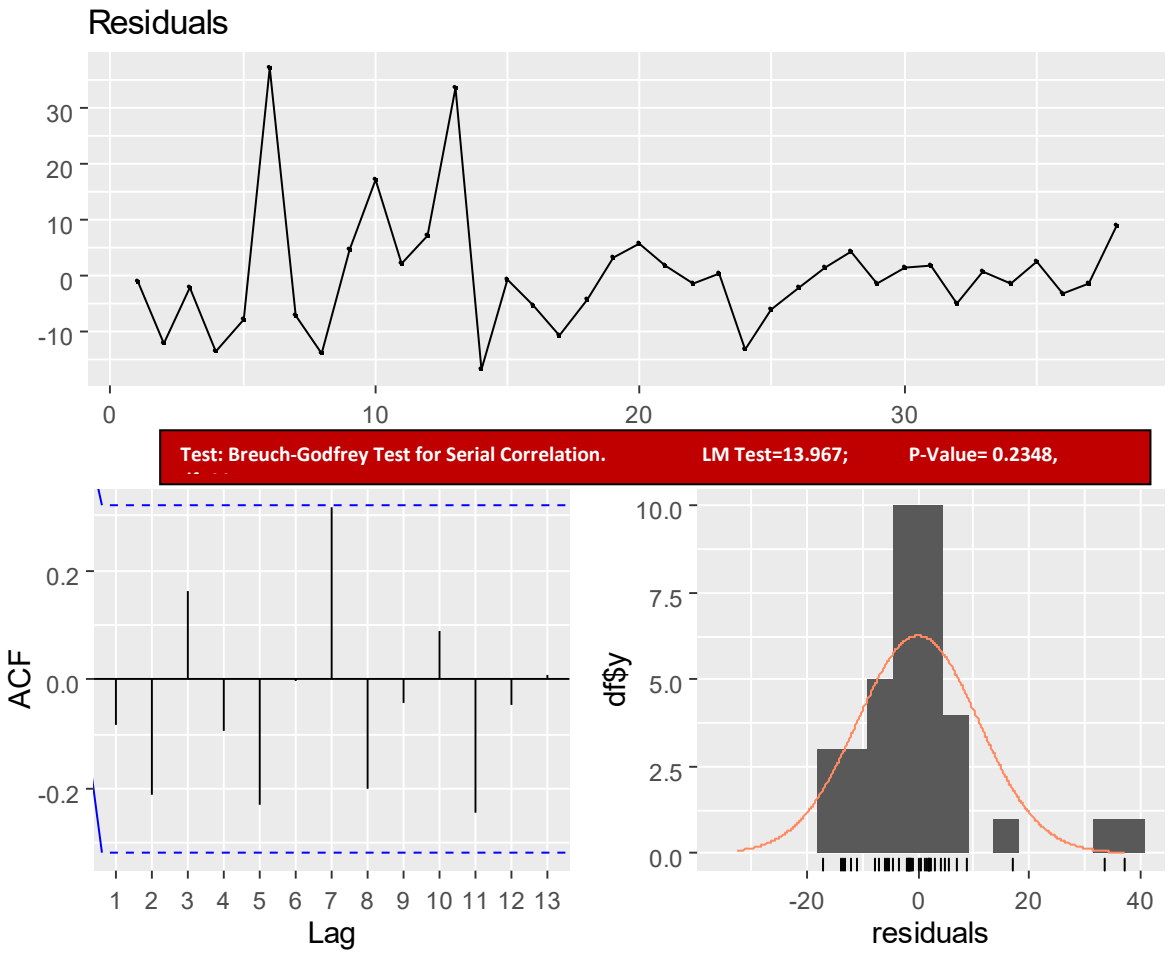


Figure 4.11: UECM Model



Appendix 14:Lag selection criterion for inflation and other macroeconomic variables

Criterion	Number of Lags							
	1	2	3	4	5	6	7	8
AIC	10.83	11.14	11.382	11.508	11.622	10.963	10.801	9.756
HQ	11.01	11.45	11.825	12.084	12.331	11.805	11.775	10.864
SBIC	11.39	12.12	12.796	13.346	13.885	13.650	13.912	13.292
FPE (10^3)	50.65	70.57	95.82	122.18	168.84	125.20	200.17	240.81

Appendix 15: Granger Causality Test for the relationship between other macroeconomic variables and Inflation in Nigeria

Null-Hypotheses	F − statistic	p-value	DF	Decision
$Inflation \nRightarrow GDP$	0.4383	0.0123	1	Reject
$GDP \nRightarrow Inflation$	1e-04	0.0033	1	Reject
$Inflation \nRightarrow Unemployment\ Rate$	0.0099	0.0211	1	Reject
$Unemployment\ Rate \nRightarrow Inflation$	0.2214	0.0409	1	Reject

Note:$\nRightarrow$denotes non-causality from left to right

(Source: Author's computation using R version 4.1)

Bio Data

A. Personal Data

Name:

Emailaddress:

Phonenumber:

Houseaddress:

Dateofbirth:

Placeofbirth:

Nationality:

Maritalstatus:

Nameandaddress of next of Kin:

B. **EDUCATIONALBACKGROUND**

I. EDUCATIONALINSTITUTIONATTENDEDWITHDATES

i. Primary Education

ii. Secondary Education

iii. Higher Educational Institution

C. **Working Experience with Dates**

Dateofassumptionofduty incurrentestablishment:

Statusoffirstappointment in currentestablishment:

Presentposition:

Dateofcommencement:

Name	**Date&Signature**

University Compliance Certification

This is to certify that the thesis by **Olamilekan Olanrewaju, Olaosebikan**in the Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan is infull compliance with the approved University Format and Style.

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Name Date