Effect of Exchange Rate Movement on Inflation in Nigeria

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Certification

This is to certify that **Sunday Aderibigbe ADELERE** with Matriculation number **LCU/PG/001647** carried out this research work titled **'Exchange Rate and Inflation in Nigeria'** in the 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

This work is dedicated to God Almighty for His infinite mercies upon me.

Acknowledgements

First and foremost, I would like to express my heartfelt gratitude to God Almighty for his infinity mercy over my life from the beginning of this program to till the end. I adore His name for divine protection, provision and sustenance despite all the constraints.

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Abstract

This study investigates symmetric and asymmetric of exchange rate on inflation in Nigeria over the period of period 1986-2022. The study also examines the response of inflation in Nigeria to shocks in exchange rate, The results of unit root tests indicate the existence of both stationary and non-stationary variables which made adoption of Bounds cointegration test plausible as well as the Autoregressive Distributed Lag (ARDL) model and Nonlinear Autoregressive Distributed Lag(NARDL) methodologies applicable. The result of the first model which explains the effect of exchange rate on inflation in Nigeria showed that in the short run,exchange rate, GDP/Capita, interest rate, import price and money supply have significant effect on inflation. While exchange rate, money supply and GDP per capita negatively affect inflation in the short run, import price exerts a positive influence on inflation. In the long run, exchange rate, GDP per capita, import prices and interest rate do not significantly affect inflation in the long run. For the second model which explains the non-linear effect of exchange rate on inflation, it is evident that asymmetries exist in the relationship between exchange rate and inflation. Exchange rate increase has a positive effect on inflation, while a decrease in exchange rate has a reducing effect on inflation. Money supply and interest rate also has a negative effect on inflation. Import prices and GDP per capita also have positive relationships with inflation in the short run. For the long run estimates, a positive increase in exchange rate has a positive effect on inflation and a negative exchange rate has a negative effect on inflation. GDP per capita, import prices and interest rate have positive effects on inflation, while money supply has a negative effect on inflation.Unanticipated shocks from exchange rate to inflation are also seen to be temporary as they are mean reverting. Finally, by policy recommendation, government should therefore adopt domestic policies that promote price stability.

Keywords: *Exchange Rate, Inflation, Asymmetries, Money Supply, Interest Rate*

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Chapter One

Introduction

1.1 Background to the Study

The crucial role that inflation plays in stabilizing macroeconomic variables continues to be a topic of discussion and contention among economists. Steady inflation is necessary for economic growth in addition to price and monetary stability. Interest rates, inflation, and exchange rates are all components of price and monetary stability, which is essentially the responsibility of central banks across the world. However, price volatility in relation to inflation may sometimes be caused by structural problems; these traits are exclusive to developing nations like Nigeria. Since they may be an adverse source of cost drivers impacting inflation rates, it is essential to examine the internal and external sources driving inflation. Inflationary reasons are well supported by a wealth of theoretical and literary data. However, comprehensive analyses of the symmetric and asymmetric effects of exchange rates on inflation are few, and those that are found differ significantly across nations.

A wide, continuous, and persistent rise in the average price of goods and services within an economy is what economists commonly refer to as inflation. Rather than a noticeable increase in prices, inflation is characterized as a broad, continuous, and persistent increase in the average cost of goods and services[1]. According to the definition, price increases for goods and services have to be "general, continuous, and persistent" in order to qualify as inflationary. The measures of global economic growth and development are

weakened by inflationary pressures. The greatest average inflation rates, at 15% and 16%, respectively, were recorded in the 1980s and 1990s. In the 1970s, the average for developed countries was 9%, while the average for developing countries was 37%[2]. Stable prices for goods and services at an inflation rate that doesn't negatively impact the company, finance, or economy are the main goals of the twenty-first-century economic system[3]. Wages, consumption, investment, innovation, and output all rise at an inflation rate between 2 and 6%, which has a noteworthy and favorable impact on the economy[4]. Double-digit inflation has negative micro and macroeconomic effects by weakening consumer buying power and lowering indicators of economic growth and development. The detrimental effects of inflation have dominated public discourse since the 1970s in both industrialized and developing nations, most notably Nigeria, and are a major source of worry for all parties involved.

The price of the Nigerian naira stated in terms of one US dollar is known as the exchange rate, and it is a macroeconomic indicator. A major expenditure that connects domestic and international expenses is the currency rate[5]. It simply refers to the relative worth of one currency to another. One of the most significant prices in the economy, the exchange rate affects domestic pricing for traded goods as well as imports and exports[6]. The appreciation or depreciation of the local currency has a significant impact on the economy as the exchange rate is determined by calculating the amount of domestic currency required to purchase one unit of foreign currency. When one takes into account a small open economy that is unable to affect trade prices globally, one finds that rising national currency values result in lower domestic trade prices and falling national currency values in higher domestic trade prices[5].

Changes in exchange rates have an impact on both imports and exports. Specifically, a rise in the value of the home currency reduces the cost of traded goods, hence raising domestic demand while decreasing the amount provided. Consequently, the volume of exports decreases and the number of imports increases. Conversely, a decline in the value of the national currency drives up the price of traded products, boosting supply and decreasing demand inside the country. This suggests that although imports are down, exports are increasing.

Exchange rate indicates a nation's competitiveness in the world economy in addition to serving as a vital relative price that links domestic and international markets for investments and products[7]. Investors and entrepreneurs would prefer a steady exchange rate over a volatile one due to the effects on the economy and enterprise. Because persistent fluctuations in the exchange rate usually led to a continuous depreciation of the local currency, they are referred to be volatile in exchange rate parlance.

Nigeria’s reliance on foreign cash from crude oil has made foreign currency essential in the recent past, given the commodity’s declining price on the world oil market. The fortunes of the nation are greatly influenced by the value of the US dollar. Since almost all of Nigeria's consumption is imported and over 95% of its income comes from crude oil, the country's economy is vulnerable to changes in the value of the US dollar. Our present excessive cost of living is a consequence of the decline in the value of our currency, which has also increased our debt load, reduced our foreign reserves, slowed domestic output, and impeded government efforts to expand the industrial sector.

High inflation is often seen to have mostly negative effects on the economy. It has been the responsibility of policymakers to reduce and stabilize the pace of inflation since the 1970s. Demand-side inflation and supply-side inflation are the two types of inflation. Both internal and external factors may contribute to inflation in a free market economy like Nigeria. Increases in the price of commodities globally and adjustments to the actual exchange rate are examples of external influences. However, the way in which the exchange rate influences inflation is determined by the exchange rate regime of country[9].

Limiting the danger of significant swings in the economy, particularly in the rate of inflation, is made possible by the Real Exchange Rate (RER) regime. Under Nigeria's variable exchange rate system, changes in the RER have a significant impact on price and production due to the combined effects of supply and demand. A nation enters the global market as a price taker when it imports products. Local currency depreciation or devaluation has an instant impact on supply-side production and pricing levels. Depreciation or devaluation has an indirect impact on the cost of capital assets that businesses purchase to use as inputs in their manufacturing operations.

Nigeria's currency is presently depreciating due to a number of factors, such as growing demand for foreign exchange (namely, the US dollar), lowering oil prices globally, land border closures, the impact of the coronavirus disease of 2019 (Covid-19) on the country's economy, and rising rates of inflation. Exchange rate variations are seen to have a major impact on inflation even if there are many underlying causes for it in the nation, including structural, supply, and demand variables[10].

1.2 Statement of the Problem

Nigeria had a low single-digit inflation rate before to 1980, but things took a sharp turn for the worse starting in 1986, when the country's inflation rate reached double digits. The present inflation in Nigeria has its historical roots in the dramatic growth in oil money during the early 1970s, which led to higher government expenditure and aggregate demand without commensurate increases in domestic output production. The overall level of prices increased as a consequence of the monetization of oil revenues, which increased the money supply. The inflation rate increased from 13.7% in 1986 to 48.8% in 1992 and then to 76.8% in 1994. It plummeted to 16.5% in 2001, surged to 23.8% in 2003, and then dipped again to an average of 11%–13% from 2004 to 2015[14]. However, it increased to 18.55% in 2016, fell to 12.09% in 2018, dropped to 11.4% in 2019 and then increased to 13.39% in 2020. As a result, the years-long rise in inflation has threatened economic stability in addition to lowering the buying power of the majority of ordinary Nigerians.

Since that the inflation rate and exchange rate are the primary indicators of economic performance, the monetary authorities, economists, and policy analysts have been gravely concerned about the negative effects of inflationary pressure resulting from exchange rate depreciation. Similarly, in recent times, the issue of asymmetric relationship is becoming prominent in the exchange rate-inflation nexus. As a result, evaluating the relationship between monetary policy, exchange rates, and inflation rates is important because doing so is necessary for the effective implementation of inflation targeting, which the Nigerian government has also made a top priority in order to achieve its macroeconomic goal.

Changes in short-term interest rates, which are one of several factors influenced by monetary policy stance under inflation targeting, include exchange rate[12].Therefore, this research aims to explore empirically the effects of exchange rate on inflation in Nigeria.

1.3 Research Questions

The following questions were raised to guide the study;

(i) What is the effect of exchange rate on inflation in Nigeria?

(ii) What is the asymmetric effect of exchange rate on inflation in Nigeria?

(iii) To what extent does inflation respond to shocks in exchange rate in Nigeria?

1.4 Objectives of the Study

The main objective of this study is to examine the relationship between exchange rate and the inflation in Nigeria, while the specific objectives are to:

(i) examine the effect of exchange rate on inflation in Nigeria;

(ii) determine if asymmetries exist in the relationship between exchange rate and inflation in Nigeria; and

(iii) evaluate the response of inflation to exchange rate shocks in Nigeria.

1.5 Hypotheses

The following null hypotheses were formulated and tested;

H_o1: there is no significant effect of exchange rate on inflation in Nigeria;

H_o2: there is no significant asymmetric effect of exchange rate on inflation in Nigeria

H_o3: exchange rate shocks have no significant effect on inflation in Nigeria

1.6 Scope of the Study

This research work is designed to cover the period 1986-2022a period of thirty-five years. The scope consists of the regulatory and deregulatory exchange rate period i.e. the fixed exchange rate and the floating exchange rate period. The study is based on core macro-economic performance of Nigeria between 1986 and 2022.

1.7 Significance of the Study

This study is important, particularly at this period when the Nigeria economy is currently facing unstable exchange rate and hyperinflation. Specifically, If the research finds that exchange rate changes have asymmetric effects on inflation, policymakers might need to consider adjusting monetary policy tools, such as interest rates, to counteract the inflationary pressures resulting from currency depreciation. Asymmetric exchange rate effects could influence fiscal policies, especially those related to government spending and revenue collection. Policymakers might need to be cautious about fiscal expansion during periods of currency depreciation to prevent exacerbating inflation.

Furthermore, the findings could guide the central bank in managing exchange rate fluctuations more effectively. Policies that mitigate the negative impact of rapid currency depreciation on inflation could be implemented. Also, the research might prompt policymakers to reconsider trade policies that affect the country's external sector. A better

understanding of how exchange rates impact inflation could lead to adjustments in import tariffs and export incentives.

Finally, the research findings could emphasize the importance of maintaining price stability to safeguard against the inflationary consequences of exchange rate volatility. Policymakers might need to adopt measures that prevent sharp increases in prices due to exchange rate fluctuations.

1.8 Operational Definition of Terms

Inflation: is a sustained rise in the general level of prices in the economy. It is the persistent tendency for the general price level to rise.

Exchange rate Exchange rate is a macroeconomic indicator which defines the price of Nigeria's naira expressed in terms of one unit of the United States dollar.

Exchange rate volatility: Exchange rate volatility refers to the erratic fluctuations in exchange rates.

Money supply: This is the total quantity of money in an economy at point in time.

Export: This is goods and services sold by people in one country to people in another count

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Chapter Two

Literature Review

This section reviews various literatures on inflation and exchange rate. First, the conceptual review defines inflation and explains more precisely the concepts. Second, the theoretical review gives insight into the various theories that have been propounded on inflation. Lastly, the empirical review that bothers on the empirical findings by other scholars will also be examined.

2.1. Conceptual Review

2.1.1. Inflation

Price increases for products and services result in inflation. Inflation is the phrase used to describe a persistent price rise that surpasses a certain threshold. For instance, a rise in the money supply would cause the price level to rise rapidly. One definition of inflation is a persistent increase in the average level of prices[1]. Any widespread and continuous increase in the average level of prices within an economy is referred to as inflation. A consistent or sporadic increase in the average price level within an economy is referred to as inflation. An rise in price on its own does not always indicate inflation. For a price rise to be considered inflation, it must be widespread across the economy, general, and ongoing. There are several types of inflation discussed in the literature. Here are a few

instances of these variations: Demand-pull inflation is the state in which total demand rises without a commensurate rise in supply, while supply-push inflation, also known as cost-push inflation, is the state in which supply falls as a result of rising commodity production costs[2].

There are two kinds of inflation: hyper-inflation and creeping inflation. The term "creeping inflation" describes a long-term, gradual, but steady increase in the overall price level. Put otherwise, the state of a general price increase lasts for a considerable amount of time but does so at a modest and reasonably constant rate. It will gradually increase yet continue to deteriorate. Hyper-inflation, sometimes referred to as "runaway or galloping inflation," is a kind of inflation marked by abrupt price increases that reach 50% or more on a monthly basis. Hyperinflation has the potential to cause a rapid decline in a country's currency's value and weaken the public's trust in it. When prices increase at double- or triple-digit rates, it is called hyperinflation. In such circumstances, the pace of inflation becomes completely unmanageable. Prices often treble daily and have a tendency to climb extremely quickly. The scenario culminates in the complete breakdown of the monetary system due to the persistent decline in the buying power of money. On the other hand, hyper-inflation often passes quickly, in contrast to creeping inflation. The consumer price index is used to calculate the inflation rate. The average change in prices of goods and services over a certain period of time is measured by the consumer price index, or CPI.

A persistent increase in the average level of prices throughout the economy is referred to as inflation. It is the enduring propensity for the level of general prices to increase[1].

Usually, macroeconomists examine two indicators of the level of prices. The consumer price index and the GDP deflator are these metrics. The average cost of final items generated in the economy is provided by the GDP deflator. Macroeconomists also consider the consumer price index (CPI), since consumers are interested in the average cost of the things they purchase. The percentage change in the consumer price index during a one-year period, calculated using this index, is the rate of inflation. It is possible for the overall price level to continue rising either as expected or unexpectedly. All persons and organizations within the economy may expect it and get full recompense if it is properly expected. In this scenario, the distribution of wealth and income within the economy will not be significantly impacted by inflation.

However, there are three possible reasons why inflation might not be expected: (a) if the economy as a whole fail to accurately predict inflation, causing the actual rate of inflation to exceed the expected rate; (b) if a particular group or individual in the economy fails to accurately predict inflation, leading them to seek lower money wage increases than are actually necessary to maintain real wages. (c) In the event that certain people or organizations are unable to fully compensate for inflation, even if they may have accurately predicted it (due to weak unions or contractually fixed earnings, for instance). There will be a redistribution impact in cases when inflation is unforeseen by the economy as a whole, by groups or individuals within it, meaning that some people will become better off while others will get worse off. Some potential redistributive implications of unexpected inflation include the following. Income from fixed-income earners and workers with weak unionization is redistributed to those with high unionization due to inflation.

Lenders suffer during inflation but borrowers benefit as the actual value of debts at the time of repayment will be lower than what was agreed upon when the loans were issued. The government receives a redistribution of taxpayers' income due to inflation. This is because those with some real income shift into higher tax banks and pay a larger percentage of their income in taxes as money earnings grow.

2.1.2. Causes of Inflation

Inflation is typically caused by demand outpacing supply, but the historical reasons for this phenomenon can be further broken down into demand-pull inflation, cost-push inflation, increased money supply, devaluation, rising wages, and monetary and fiscal policies[3].

2.1.2.1. Demand-pull Inflation

The most common cause for a rise in prices is when more buyers want a product or service than the seller has available. It's interesting because, unless there's a reason the supply is diminished that affects cost, the price doesn't have to increase. It rises because sellers recognize that buyers are willing to pay more if it's something they really want.

2.1.2.2. Cost-push Inflation

Sometimes prices rise because costs go up on the supply side of the equation. These increased supply-side costs such as materials, wages, and energy, make the product or service more expensive. Therefore, the seller has to charge more to maintain a profit.

Depending on the amount of demand, sellers may not always be able to recover all of the increase, but instead reduce their profit and absorb some of the cost themselves.

2.1.2.3. Increased money supply

Ideally, an increase in the supply of money in the economy lowers interest rates which encourage spending and investment and helps grow gross domestic product (GDP). However, this process, known as quantitative easing (QE), initiated by the Federal Reserve, can also lead to demand-pull inflation when the money supply increases faster than economic growth.

2.1.2.4. Devaluation

Devaluation is a reduction in the value of currency when the exchange rate for that currency goes lower. This makes exports less expensive and more attractive to other countries. This process also makes products from other countries more expensive in Nigeria.

2.1.2.5. Rising wages

Rising wages are a contributor to cost-push inflation. That's because wages are a cost. When workers are paid more, whatever they produce costs more and those costs are passed on to the consumer (buyer).

As with devaluation, there's also a demand-pull inflationary aspect to rising wages. Higher wages put more money in the hands of consumers who spend that money and in

doing so increase demand for products and services. Economists also note that if higher wages result in increased productivity, prices may not rise as much or at all.

2.1.2.6. Monetary and fiscal policies

The Central Bank of Nigeria is tasked with maintaining monetary policy in Nigeria.

In periods of high inflation, it attempts to lower the rate through contractionary monetary policy by increasing interest rates, increasing bank reserve requirements, and selling government securities. When the economy is facing or in the midst of a downturn, the Fed initiates expansionary monetary policy by lowering interest rates, decreasing bank reserve requirements, and buying government securities. Failing to maintain balance between these two policies can lead to inflation. In addition to monetary policy imbalance, certain other government policies can result in cost-push or demand-pull inflation. For example, tax subsidies issued by the government for products (i.e., solar panels), that can increase demand and result in demand-pull inflation. Regulations that increase costs for manufacturers could create cost-push inflation.

2.1.3 Specific Effects of Inflation in Nigeria

The following specific effects of inflation in Nigeria were reported[4]:

2.1.3.1. Planning Problems

Planning and financial plans are impacted by Nigerian inflation. Because inflation eventually leads to cost overruns that distort these plans, it is challenging to predict the

cost of living or the cost of manufacturing based on current prices. Foreign investors are discouraged from entering the economy by the volatility.

2.1.3.2. Project Execution

Authorities The challenges of inflation in Nigeria sometimes result in the abandonment of projects. Plans for projects based on current pricing may soon encounter problems since inflation could have caused the projected prices to double. It is challenging for contractors or project executors to continue such projects because of these expense overruns. This is one of the main reasons Nigeria has unfinished projects.

2.1.3.3. Discourage Savings

Savings are discouraged in an inflationary environment because inflation reduces the actual worth of the money saved. Saving money during inflation is thus inefficient, yet savings are necessary for investments. In addition to investments, we always need to deal with unforeseen problems. And this is a huge difficulty in an economy where money is hard to come by.

2.1.3.4. Inequality

Social inequality is exacerbated by inflation. People with early advantages often stand to gain more from inflation. Inflation is manipulated by producers to boost profits at the expense of labor. Workers get frustrated by this, which triggers their innate desire for survival techniques or other cutting-edge methods. Simultaneously, the inflation-caused

overachieved affluent Nigerian exploits his resources in a way that would promote capital flight from the country.

2.1.3.5. Pensioners and Fixed Income Earners

Nigerians on pensions and fixed incomes have been disproportionately affected by inflation. Their purchasing power has been severely diminished by inflation. In an effort to combat inflation, the Kano state government recently came to the aid of seniors by raising the minimum pensioner's nominal income from around N200 per month to N6,000.00. While N200.00 was a substantial sum of money a few years ago, it may not be sufficient to purchase a piece of bread in Nigeria today or cover the cost of transportation to the designated location. The wellbeing of those on fixed incomes is adversely affected by the decline in real earnings.

2.1.4 Nigerian Inflationary Factors

Despite the generic theories that attempt to explain inflation globally, there are other factors that determine inflation in Nigeria[4]. Among such are:

i. Corruption

ii. The prevalence of multiple taxing

iii. Limitations on productivity

iv. A lack of work ethics

v. Inadequate social infrastructure

vi. Inadequate government funding

vii. Unexpected pay rises

viii. Insufficient storage space

ix. Dependency on import

x. Mechanism of Distribution

xi. Excessive borrowing costs xii. Other economic considerations

xiii. Re-dominance of currency

These elements are covered in the section that follows.

2.1.4.1. Corruption:

Nigeria is well recognized to be afflicted by corruption. The Nigerian economy has suffered greatly as a result. Extortion from merchants and drivers is one of the many ways that corruption appears in Nigeria. They then transfer the cost of these extortions on the ultimate customers. These may be seen at workplaces as well as on the nation's borders, ports, and roads. However, they add needless expenses to Nigeria's manufacturing costs. In addition to the standard extortion, chief executives and politicians may really upset investors or publicly funded initiatives. For instance, there's no justification for Premium Motor Spirit (PMS) petrol to cost more than N60.00 per litre in Nigeria. Coincidentally, it has been shown that corruption is a significant factor contributing to the high cost of gasoline[9].

Aside from the energy and petroleum sectors, numerous utility companies participate in shrewd business tactics that eventually drive up service costs. Those who gain from clever techniques later also often spend large amounts of money irresponsibly.

(i) Bribery;

(ii) Fraud;

(iii) Grand (political) Corruption;

(iv) Extortion; and

(v) Bureaucratic Corruption are some of the kinds of corruption that the authors seek to enumerate. However, each of them affects the production cost.

2.1.4.2. Multiple Taxation Incidences

In particular, the southern region of Nigeria needs immediate attention to address the issue of double taxes. The same individuals and organizations are subject to differing levels of government taxation on comparable goods. This is especially true for businesses. Multiple tax burdens are returned to consumers in the form of inflation.

2.1.4.3. Productivity Constraints

Nigeria's production is impacted by systemic constraints. For example, in the agricultural sector, inadequate and antiquated technology is a major impediment, as is limited access to land, the use of subpar inputs or inputs with low disease resistance. Poor harvests result from all of these. Nigeria is a developing nation with little secondary goods; therefore, production is often poor. The nation has a large population in contrast to its low productivity. There is often rivalry for the available products and services as a result

of this gap. This explains why changes in the money supply have an effect on inflation. If these obstacles are removed, the nation's production can rise.

2.1.4.4. Attitude to Work and Spending Pattern

Government involvement in several economic sectors—including ones that have historically been the domain of the private sector—has increased throughout time. The early 1970s oil boom served as fuel for this. In Nigeria, a new direction is becoming apparent over time. Income is determined by the industry in which one works and the size of one's social network, not by training duration, skill level, or volume of work completed. For example, a five-year university graduate working for a global oil firm may be able to hire and pay many of his peers who work in similar fields in other industries, especially the public service, with his wages. His pay will vary depending on the position if he is elected to a political post, but if he works in the official sector (minister), he will be paid in "levels." Earnings and output may have little or nothing in common. Thus, there is a terrible work mentality. Some feel unsatisfied, while others believe that working for the government is "nobody's business." Furthermore, the influence on production is significant due to the size of the government. Institutions that ought to forbid such a bad mentality at work—using phrases like "work like an ant and eat like an elephant," rather than "work as elephant and eat like an ant"—also promote such action. Attitudes that maximize profits and prices for minimal output are encouraged by the desire to eat like an elephant when you haven't worked like one. Inflation is caused by this. In addition, a worrying trend in the spending habits of many Nigerians is their love of conspicuous

consumption and overt displays of affluence in their personal (micro) lives. The public sector indulges in luxury as well[5].

2.1.4.5. Inadequate Social Infrastructure

One of the primary responsibilities of the government is to provide social infrastructure, which includes things like electricity, water, roads, communications, and security. The private sector's production costs are partially offset by the supply of these public services, which also affects the final output's cost to the customer. However, such infrastructure is laughable in Nigeria. In many instances, the investor will have to supply a backup power source because the public supply is unstable. In addition, the investor may still have to pay high taxes while building and maintaining the factory's road, providing a backup water supply, and providing security. These are the primary reasons why locally produced products and services are not competitive and why cost pressure inflation is occurring.

2.1.4.6. Government Financing of Deficits

Nigeria is rife with deficit financing; the country's operations are financed mostly by oil earnings, and when those earnings are not yet realized, borrowing may be necessary. In theory, borrowing may not be damaging, but when a company consistently overspends its revenue, particularly on recurring expenses, this can become a serious issue.

2.1.4.7. Wage Reviews

There are wage evaluations everywhere, but in many places, they are motivated by the need to control inflation or maintain the welfare of the workforce. In Nigeria, however, strike activities to demand pay hikes have been common, particularly after salaries were deregulated in the 1990s. Employers often face pressure to implement salary evaluations that lack productivity support. These have the effect of increasing the money supply as opposed to fixed or restricted production, which causes inflation. Employees often compare their pay to that of their international colleagues using the current currency rate or to that of other members of the local economy, even when the comparisons are not accurate.

2.1.4.8. Inadequate Storage Facilities

In an agricultural economy, surplus production during harvest seasons must be stored for future use. This is a present issue in the nation, although it may be effectively handled with the use of contemporary technology, storage facilities like silos, or processing into secondary goods. Farmers lose products like maize and tomatoes every year as a result of inadequate storage facilities. This affects the overall amount of items available in the market as well as the farmers' mood. Planting seasons are impacted by shortage, which drives up costs. The government should promote the widespread use of domestic technology in the processing of several agricultural products to extend their shelf life, since using outdated technology has its limitations. This will significantly contribute to price stability.

2.1.4.9. Import Dependence

Nigerians have a strong preference for imported items. Its low level of industrialization and the influx of money from petroleum products are partially to blame for this. Nigeria imports a number of agricultural items for which it is capable of becoming a net exporter, meaning that it loses a lot of money on these imports[11]. Imported goods include clothing, vehicles, and home goods in addition to agricultural items. The government has made an effort to promote the use of domestic products, although officials and the government itself are often prime instances of the inelasticity in the market for imported goods, particularly in the areas of health care and aviation and helicopter transportation. Nigeria often experiences imported inflation as a result of this reliance, which causes whatever inflation there is in the global market to be imported into the nation.

2.1.4.10. Distribution Mechanism

Some Nigerians have a tendency to labor like "ants" and eat like "elephants." Put otherwise, these individuals want maximum compensation for least labor. Due to this inclination, a large number of individuals participate in the distribution chain, taking a great deal while offering little value. For instance, contractor "A" may sell a contract to "B" for the construction of a school building. "B" then sells the contract papers to "C," and "C" sells to "D," who now tries to carry out the project in a manner that maximizes benefits for himself. This helps to explain Nigeria's low capital production ratio in public projects. Similar to this, there are a number of middlemen lining up between the manufacturer or importer and the end customer for items in the private sector. This might apply to the license holder, the real importer, the wholesaler, the retailer, and many other

parties. All of these tend to drive up the price of the goods. This does not exclude the possibility of several rent-seeking and dishonest viewpoints being pushed on the system.

2.1.4.11. High Cost of Borrowing

Another important factor affecting Nigerian inflation is the cost of finance. Inadequate capital is one of the factors impeding Nigerian output. The cost of capital is often in the double digits when it is available. This high cost is eventually absorbed by the customer as part of the production cost. A high cost of borrowing deters investors in addition to the possibility that it would result in higher output prices. Additionally, it is a source of non-performing or delinquent loans. When overall debts become unmanageable due to compound interest rates, some borrowers grow disheartened[13]. Any bank that experiences a high number of these circumstances has the risk of failing, which would further damage the state of the economy as a whole.

2.1.4.12. Extra-economic Problems

Inflation in Nigeria is also affected by a number of other factors, including social, political, institutional, and environmental ones. In Nigeria, for instance, a lack of inputs and components contributes to market failure. Pricing is adjusted by businesses that function as oligopolies, monopolies, etc. to get rent revenues. The value that many Nigerians put on material trappings serves as further fuel for this. In addition, the distribution of central economic resources and the size of the public sector are often not at their best.

Nigeria's Inflationary Episodes: Some Stylized Facts

Since 1970, Nigeria has seen four significant periods of inflation over thirty percent. The first episode was in 1975, with an inflation rate of 33.7%. The Northern Nigerian drought, which increased food costs, and the overzealous monetization of the substantial influx of cash resulting from the crude oil boom were the main causes of this development. The moving standard deviation of the headline inflation rates from year to year indicated substantial volatility throughout this time as well. The reduction of import duties on a comparatively large number of goods and raw materials, a deliberate monetary policy aimed at encouraging banks to lend more to the productive sectors of the economy, and the creation of the Anti-Inflation Task Force, which recommended the creation of the Productivity, Prices and Incomes Board, were some of the measures taken to control the situation. These account for the slow reduction in the average inflation rate and its volatility from 1976 to 1983.

The year 1984 also marked a noteworthy occurrence, with the inflation rate reaching a greater level of around 41.2% due to predictions of an impending depreciation of the national currency and monetary expansion. surged inflation volatility was also seen during this time period, as shown by the estimated 12-month moving standard deviation, which surged over 15.0 in 1985 and above 10.0 in 1984. As a reaction, the military government implemented more price controls, which caused the inflation rate to drop to 5.5% in 1985 and 5.4% in 1986 as well as the standard deviation to drop to less than 5.

The third episode of high inflation occurred during 1988 and 1989 caused by fiscal expansion of the 1988 budget, which was financed by credit from the CBN. The standard

deviation of the headline inflation rate stood at 25 in 1988 before falling to about 7 in 1990. Increased agricultural production helped to moderate inflationary pressures in 1990 as the inflation rate fell to 8.2 percent. The fourth inflationary episode, which began in 1992 and lasted almost five years until peaking at more than 80.0% in 1995, was the most tumultuous in Nigeria's history. At around 15, the moving standard deviation was also very large. This progress was mainly caused by fiscal expansion and monetary growth. In reaction to the period's inflationary pressures, the government reinforced its economic stabilization policies, firmly establishing stable exchange rates, prudent monetary policy, and budgetary restraint. As a consequence of these actions, the inflation rate systematically decreased from nearly 80.0% in 1995 to 7.1% in 2000. But the last period of volatile inflation was between 1996 and 1997. We may deduce from the previous research that times of high inflation are correlated with times of high inflation volatility.

2.1.5. Exchange Rate

The rate at which one currency may be exchanged for another is known as the exchange rate. It is the cost of a nation represented in foreign currency of another country. For instance, the dollar depreciates when the exchange rate between the British pound and the US dollar rises from, say, $1.80 to $1.83. This exchange rate is often expressed in dollars per pound sterling ($/£). A rise in the exchange rate from, instance, ¥108 to ¥110 indicates an appreciation of the dollar. The exchange rate between the Japanese yen and the US dollar is often expressed in terms of yen per dollar (¥/$). Certain nations have

floating exchange rates, meaning that supply and demand control the price of foreign currency rather than the central bank, which is the nation's monetary authority.

Until the 1970s, the primary sources of supply and demand for foreign currency were the imports and exports of goods. Financial transactions predominate nowadays by a wide margin. Typically, market players choose to purchase assets denominated in that currency in the hopes of future appreciation, which causes the exchange rate to increase. In the long run, currency rates are determined by macroeconomic fundamentals, according to economists. The appreciation of a nation's currency is believed to occur in response to certain basic factors, such as improvements in the economy's growth rate, trade balance, inflation rate, or real interest rate, which accounts for inflation[5].

The quantity theory of money serves as the foundation for one straightforward model for calculating the long-run equilibrium exchange rate. A one-time increase in the money supply is quickly reflected as a corresponding rise in the domestic price level, according to the domestic version of the quantity theory. According to the international version, a commensurate rise in the exchange rate likewise corresponds to an increase in the money supply. The demand for money (domestic compared to foreign), which is impacted both favourably and adversely by the pace of development of the real economy, may be seen as the determinant of the exchange rate, which is the relative price of money (domestic per foreign)[6].

2.1.6. System/Regime of Exchange Rates

A system of exchange rates comprises the organizations, arrangements, and laws that govern how countries make payments to one another. It shows how the value of one currency may be calculated in relation to another. Either a fixed or variable exchange rate system is possible.

2.1.6.1 Constant Currency Rates

Fixed or pegged exchange rate is a rate the government (central bank) sets and maintains as the official exchange rate. The primary international currency (typically the US dollar, but sometimes other significant currencies like the euro, the yen, or a basket of currencies) will be used to calculate a predetermined price. The central bank purchases and sells its own currency on the foreign exchange market in exchange for the currency to which it is tied in order to preserve the local exchange rate. The central bank will need to make sure it can provide the market with those dollars, for instance, if it is found that one unit of local currency is worth $3 US. The central bank has to maintain a large amount of foreign reserves in order to sustain the rate. This is the amount of foreign exchange that the central bank has set aside and is able to employ to either release or absorb excess cash from the market. This guarantees a suitable money supply, suitable market oscillations (inflation/deflation), and eventually, the exchange rate. When required, the central bank may also modify the official exchange rate.

2.1.6.2 Floating Exchange Rates

A floating exchange rate, in contrast to a fixed rate, is set by supply and demand on the private market. A floating rate is often referred to as "self-correcting" since the market

will automatically adjust for any discrepancies in supply and demand. Examine this simplistic model: when a currency has low demand, its value decreases, increasing the cost of imported items and driving up demand for domestic goods and services. More employment will be created as a result, autocorrecting the market. An exchange rate that is floating is dynamic. No currency is really completely fixed or floating. Market forces may also affect exchange rate fluctuations in a fixed regime. Occasionally, when a local currency really appreciates in relation to its pegged currency, a "black market" that more accurately reflects supply and demand may emerge. The black market's activities will then often come to an end when a central bank is compelled to adjust or depreciate the official rate to bring it into line with the unofficial one. The central bank of a floating system may also step in to maintain stability and prevent inflation, albeit this is less common in these situations.

2.1.7 An Overview of Foreign Exchange Policies in Nigeria

Over the last 60 years, there have been several modifications to the currency rate rules and regimes in Nigeria. When it was pegged to the British Pound Sterling in 1960, it had changed from a fixed parity. Following the depreciation of the pound sterling in 1967, the parity exchange system introduced the US dollar. The US Dollar's rise to strength in 1972 forced the suspension of the British Pound's parity exchange rate regime. The depreciation of the US dollar led to the reinstatement of the fixed parity with the British Pound in 1973. In 1974, the US dollar and British pounds were used to bind the Nigerian Naira to lessen the negative effects of the devaluation. The worldwide market's rising price of crude oil led to a sustained appreciation of the Naira's nominal exchange rate

almost entirely throughout the 1970s. These increases in nominal exchange rates resulted in an excessive reliance on imports, discouraged non-oil exports, and capital flight, all of which contributed to the depletion of external reserves and balance of payments issues. A growing marginal tendency to import caused Nigeria's agriculture economy to collapse[7]. In 1978, the value of the Naira was fixed to a basket of twelve currencies, which included important trade partners. However, the Naira was quoted versus the dollar in 1985, replacing the 1978 arrangement. The overall exchange rate policy before to 1986 fostered the Naira's overvaluation[8].

As part of the Structural Adjustment Programme Package, the Naira was deregulated in September 1986 in order to solve the problems brought on by the overvaluation. In order to support the structural adjustment program, the Second-tier Foreign Exchange Market (SFEM) was established. SFEM was tasked with creating a system for allocating and determining exchange rates in order to maintain both the long-term equilibrium of the balance of payments and its short-term stability[9]. One of the main goals of SFEM is to use supply and demand to interact to create a realistic Naira exchange rate, boosting non-oil exports, making sure resources are allocated effectively, eradicating currency trafficking by eradicating the unauthorized parallel foreign exchange market, promoting foreign exchange inflow and discouraging outflow, and maintaining the nation's balance of payments[9].

To achieve the objectives of SFEM, a number of changes were adopted, including the Dutch Action System, the wholesale Dutch Auction System, the Foreign Exchange Market (FEM), and the Autonomous Foreign Exchange Market (AFEM). In July 1987,

the issue brought about by the first- and second-tier market rates led to the introduction of the FEM. The Bureau de Change was established in 1989 in order to expand the use of FEM. In 1994, the foreign currency rate system was reinstated. A policy reversal of managed deregulation, known as the Autonomous Foreign Exchange Market (AFEM), was introduced in 1995. In 1999, the interbank foreign exchange market, or IFEM, was reopened. This resulted in the combination of the two exchange rates once the official exchange rate was abolished on January 1, 1999. The reintroduction of the Dutch Auction System (DAS) in 2002 was prompted by the increasing demand in the foreign currency market and the ongoing depletion of the nation's external reserves.

In order to establish a fair exchange rate for the Naira, the market was further liberalized in 2006 with the introduction of wholesale DAS. Up until today, there has been oscillation between fully-managed and freely-floating exchange rate regimes in Nigeria. The "Flexible Exchange Rate Inter-bank Market," a controlled floating FOREX market, was restored by the governing body CBN in 2016[8]. The Nigerian exchange rate control system of events is shown in Table 1.

Political influences have affected Nigeria's economic policies, including exchange rate and capital control measures, according to an analysis of the literature and data currently in existence. Administration of Exchange Rate Policy and Capital Control in Nigeria[10]. In response to political pressure, officials implement measures that more closely align with the political agendas of their patrons than with the reality of the economy. Therefore, political expediency or preferences have influenced some of the capital restriction and currency rate policies that Nigeria's top bank has implemented since the country's

independence. The political realities of the moment, which account for the high rate of instability and inconsistency in foreign exchange policies by various government regimes in the nation, are, in fact, the primary cause of the many and sometimes contradictory exchange rate policies and policy regimes in the nation.

The aforementioned information suggests that a range of political considerations, such as the date of elections, will probably have an impact on exchange rate policy. Wide-ranging economic indicators including buying power, export costs, price levels, and real wages are all impacted by the real exchange rate and have political significance since some voters use these indicators to choose their leaders. It is true that before to elections, governments often increase the value of their currencies, postponing a devaluation until after the election[11]. Governments may refuse to devalue the currency for political reasons alone, without regard to economic considerations, due to the political unpopularity of a devaluation-induced decrease in national buying power.

The type and personality of the political leadership in Nigeria have also had an impact on capital restriction and exchange rate policy. Pro-Western regimes and administrations often capitalize on the worldwide trend toward further economic liberalization, as advised by the IMF and World Bank. These regimes aim to implement a market-based or floating exchange rate system. General Ibrahim Babangida (1985–1993) and Chief Olusegun Obasanjo (1999–2007) are two notable administrations in this respect. Conversely, governments that are not inherently hostile to the West but do not follow the worldwide movement toward economic liberalization are more likely to support a fixed exchange

rate regime. The administration of General Sani Abacha (1994–1998) serves as one example.

Table 1: Schema of Events in Exchange Rate Management in Nigeria

S/N	YEAR	EVENT	REMARK
1	1959-1967	Fixed parity solely with the British pound sterling	Suspended in 1972
2	1968-1972	Included the US dollar in the parity Exchange	Aftermath of the 1967 devaluation of the pound and the emergence of a strong US dollar.
3	1973	Revert to fixed parity with the British pounds	US dollar. 3. 1973 Revert to fixed parity with the British Pounds Devaluation of the US dollar
4	1974	Parity to both pounds and US dollar	To minimize the effect of devaluation of the individual currency.
5	1978	Trade (import)-weighted basket of currency approach	Tied to 7 currencies- British pounds, US dollar, German mark, French franc, Japanese yen, Dutch guilder and Swiss franc
6	1985	Referenced on the US dollar	To prevent arbitrage prevalent in the basket of currencies.
7	1986	Adoption of the Second-Tier Foreign Exchange Market (SFEM)	Deregulation of the economy
8	1987	Merger of the first and second-tier Markets	Merger of rates
9	1988	Introduction of the inter-bank foreign exchange	Merger between the autonomous and the FEM rates

		market (IFEM)	
10	1994	Fixed exchange rate	Regulate the economy
11	1995	Introduction of the Autonomous foreign exchange market (AFEM)	Guided deregulation
12	1999	Re-introduction of the inter-bank foreign exchange market (IFEM)	Merger of the dual exchange rate, following the abolition of the official exchange rate from January 1, 1999
13	2002	Re-introduction of the Dutch Auction System (DAS)	Retail DAS was implemented at first instant with the CBN selling to end-users through the authorized users (banks)
14	2006-date	Introduction of Wholesale DAS	Further liberalized the market

Source: Extracted from Mordi, C.O. (2006)

2.2 Theoretical Review

2.2.1 Theories of Inflation

Several theories have been posited to explain inflation worldwide. They include: Demand – pull inflation; Cost – push inflation; Structural inflation; imported inflation.

2.2.1.1 The Demand-Pull Theories of Inflation

According to demand-pull theories of inflation, inflation occur when total demand exceeds total supply of goods and services, rising prices overall. Usually, when there are shortages, there is rivalry for the few things that are available, which results in some type of unofficial bidding for the available goods. The private market for consumer products, corporate demand, government demand, and the need for inputs and final production all contribute to the aggregate demand for these commodities and services. Because demand-pull inflation results from too much money pursuing too few products, it is also known as excess demand inflation. It usually happens in situations of full employment because the extra strain on the production elements raises their prices, which in turn raises the cost of production. It could also be a short-term event caused by poorly predicted demand dynamics. Inflation may also result from demand that exceeds achievable output levels when there are production restrictions.

Demand-pull inflation may happen during periods of cyclical expansion during or just after a conflict, which explains why rates were so high in Nigeria in 1969 and 1970. Throughout the conflict, inflation was likely to reach a peak of 20 percent or more. The Biafran enclave experienced triple-digit inflation. It's possible that they were not formally recorded in their precise forms. Put another way, most people think that Nigeria's inflation rates are underreported. The Keynesian theory or either the old or new quantity theory of money may be used to explain the demand-pull inflation. The relationship between money and average price levels is attempted to be explained by the quantity theory of money. The quantity theory, often known as the monetarists' perspective, places significant emphasis on the money supply as a primary driver of inflation, while

Keynesians place more emphasis on non-monetary variables including government expenditures, credit, and consumption patterns.

The quantity theory of money was linked by the 17th-century classical economist to the overall increase in prices. According to the basic quantity theory of money (a branch of classical economics), price increases are directly correlated with the amount of money in circulation at any given moment. Inflation is "always and everywhere a monetary phenomenon and that it is everywhere since increases in the quantity of money always exceed output," according to the monetarist school of thinking founded by Milton Friedman in 1942. The monetarist perspective might be explained using Irving Fisher's equation of exchange[13]. The analysis begins with the single identification MV=PT. According to Fisher, there must always be a buyer and a seller in the overall economy, and the value of sales and receipts must match in every transaction. The following is a mathematical model for this identity:

$$MV = PT \quad \text{.....(2.1)}$$

Where P is the general price level, T is the volume of transactions, V is the transaction velocity of money in final expenditures, and M is the amount of money (nominal) in circulation;

Fisher constructs price (P) as a function of money supply (M), volume of transactions (T), and velocity of circulation (V) in order to examine the monetarist perspective and the notion of circulation. This means that

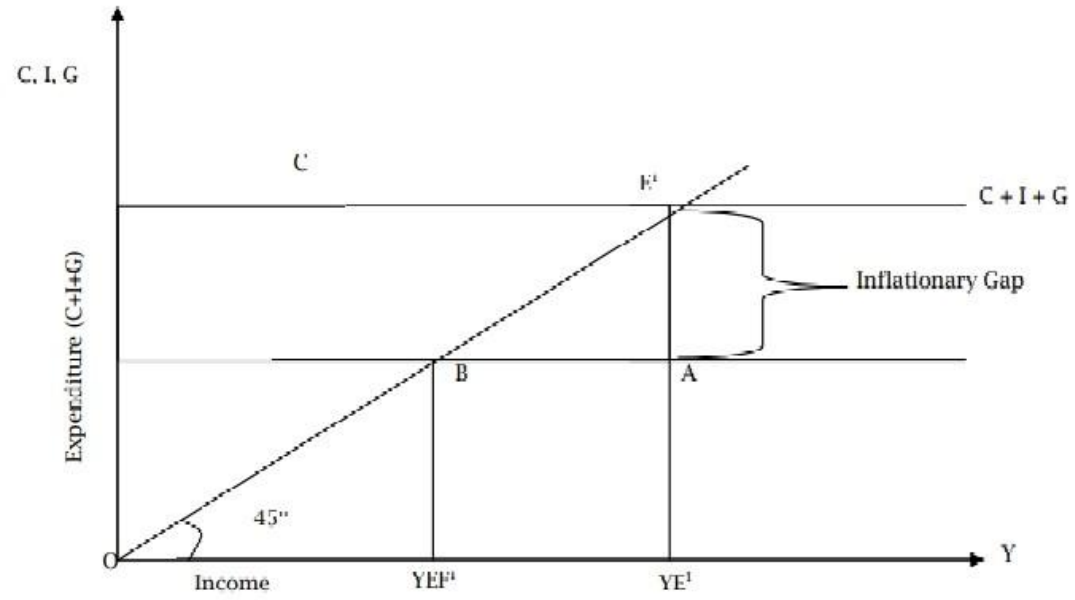
$$P = F(M,V,T) \quad \text{.....(2.2)}$$

Fisher takes V and T to be constant variables in equation (1), where MV = PT, so M fluctuates in direct proportion to P.

P = M……. (2.3)

However, Fisher's equation does not account for the effect of interest rates. Additionally, it is unlikely that M.V.P. and T are completely independent as changes to one of them might have an effect on inflation. Keynes clarified that an inflationary gap occurs when planned spending surpasses system equilibrium; in the event that the economy is experiencing underemployment, an increase in the money supply will ultimately result in a rise in output, employment, and aggregate demand. However, pricing is impacted when overall demand, production, and employment increase more. Production stops growing when the money supply rises over the point of full employment. An inflationary gap results from an excess demand over supply caused by an excess money supply. According to Keynes, this is the real cause of inflation. A visual representation of Keynes' inflationary gap analysis may be seen in Figure 1.

Figure 1. Illustration of Keynesians Theory of Demand Pull Inflation

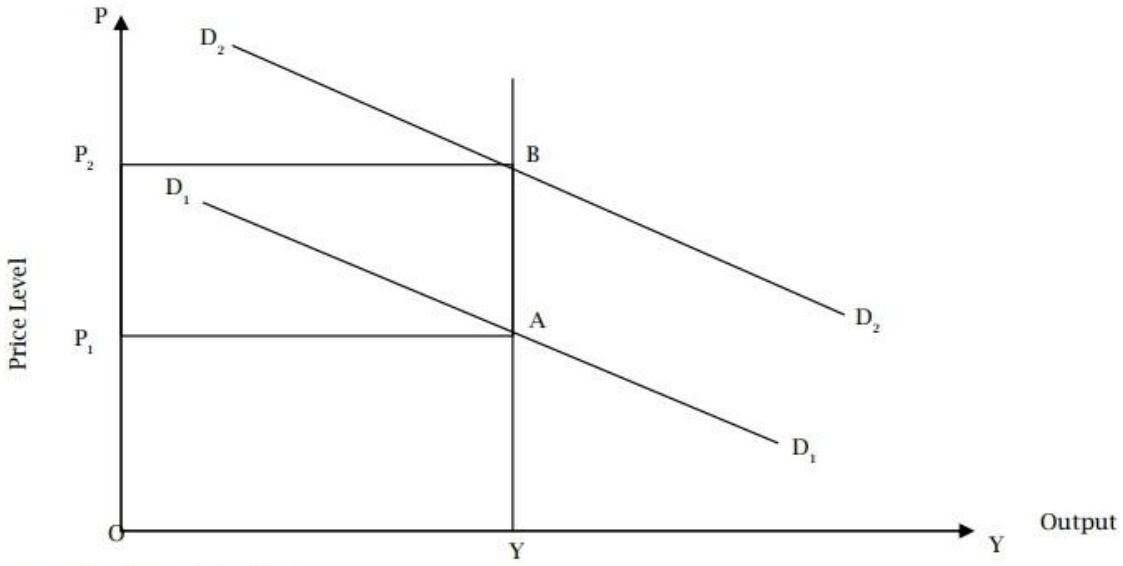


Note: See Onuchuku and Adoghor (2000)

Figure 2.1. Illustration of Keynesians Theory of Demand-Pull Inflation

The points where total production and full employment (YEF1) equilibrate are shown in Figure 1.Point B is intersected by a 45° line that serves as its representation. However, if aggregate demand continues to rise, as indicated at point E, there will be a shift in spending that will result in YE1 total expenditure and BAYE available output. Keynes is not without criticism. The main argument put out by detractors is that the inflationary gap analysis ignores the importance of the factor markets and is only concerned with the commodities market. It is stated that since the factor market is impacted by the surplus demand generated by the commodity market, inflation impacts both the factor and commodity markets. To be specific, Keynes' approach has two major shortcomings: (a) It places a strong focus on demand; (b) It downplays the chance that rising prices may provoke additional rises in aggregate demand, which could then trigger yet higher prices.

Figure 2. The Demand Pull Theory of Inflation (Quantity Theory Version)



Note: See Gbanador (2007)

Figure2.2 . Illustration of Demand-Pull Inflation

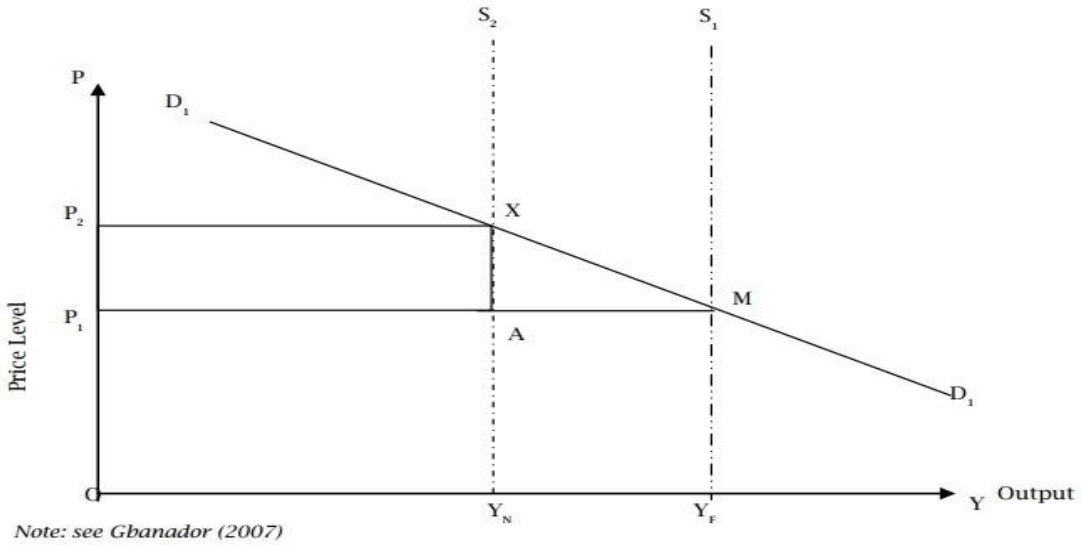
Figure 2.2 shows that if the economy is in full employment, the Equilibrium price P1 cuts the Demand curve Di at A. However, further demand as shown in D2 will raise prices to P2. It means that employment, and aggregate supply cannot be increased at the short run to offset the excess demand created by the shift. This is because output and supply are fixed at 0Y1.

2.2.1.2 Cost – Push Theories of Inflation:

Cost-push inflation refers to supply-side inflation. It is often brought on by growing manufacturing costs. This happens when manufacturing expenses rise and have an effect on the end product's pricing. Because the supply side of the economy is the source of the rise in prices for goods and services, cost push inflation is also known as "market power inflation." These hikes might be the result of rising pay rates or declining productivity,

which raises the cost of labor production as well. It might also result from other production-related variables or input costs like raw materials, transportation, or power supplies. Corruption and double taxes are big concerns in Nigeria. These and other variables work together to affect product cost structures and ultimate output prices. Since profit margins are often established at a certain proportion of production costs, producers would respond to an increase in input prices by raising the prices of their output, including their profit margins. However, a rise in manufacturing costs may compel manufacturers to reduce output. Producers in oligopolistic and monopolistic businesses may also have profit-driven incentives, which might lead to cost-push inflation. Due to the imperfect status of these sectors, manufacturers may use price discrimination strategies to manage their pricing.

Figure 3. Diagram Depicting the cost – push Inflation



Note: see Gbanador (2007)

Figure 2.3. Illustration of Cost-Push Inflation

Figure 2.3 shows how supply-side variables might lead to inflationary tendencies. The equilibrium point at full employment is denoted by point M. Right now, the price is P1, the amount of output is Yf, but if input costs increase (due to factors like rising labor costs or the elimination of fuel subsidies, for example), certain providers with limited resources may decide to reduce output. This will cause the specific industry's overall production to decline, as shown in YN. Supply therefore shifts from S1yF to S2YN. Due to the distortion of the whole equilibrium position caused by this drop in total supply, demand—that is, purchasers of the commodity—begins bidding for the available goods, which drives up the price of the good from P1 to P2, creating a new equilibrium point at x. In a market economy, where the market functions as an allocation of economic resources, this argument makes sense. However, examining the actions of suppliers offers another explanation for the cost-push (supply-side) inflation. Suppliers often transfer the cost of higher production to customers via broad price rises as a consequence of rising production costs, which are frequently not unique to any one company. If every supplier follows suit, the end result will probably be an increase in product pricing overall. This is more typical in faulty markets.

Cost-push inflation is a prevalent phenomenon in Nigeria. Inflation is caused by increases in the cost of products and services whenever the government sets a new minimum wage. This sometimes offsets the benefits of pay increases, sometimes making Nigerian workers poorer than they were before to salary increases; this was linked to the announcement effect16. Examples include the Shehu Shagari salary and pay review from 1980 and the Udoji award from 1973. There have been around fifteen of these salary

evaluations since 1941. These salary increases often result in inflationary circumstances since they are not accompanied by gains in productivity.

The connection between inflation and unemployment was look into in Britain[17]. He noticed that the link between inflation and unemployment was inverse. We call this the Philip's curve. He noted that low pay rates and a high unemployment rate led to low inflation due to inadequate demand. This is a characteristic of a recessionary economy as production decreases in such a setting. Prior to globe War II, this was also the state of affairs in the globe in the 1920s and 1930s. On the other hand, inflation was more likely to occur in an expanding economy with rising production. This is due to the fact that a rise in economic activity will result in the emergence of several economic forces. Due to the increased demand for these manufacturing inputs, their costs are rising. This growth in input (component) costs has the cumulative impact of raising output prices. These variables are provided by households, which gives them more economic power and makes it easier for them to absorb the expense of increased production prices. Philips' conclusion was that there is a trade-off between unemployment and inflation since they are mutually incompatible. The government should restrict its growth and full employment goals if it does not want inflation at all. However, if it chooses full employment, it must accept some degree of inflation.

2.2.1.3. Theories of Structural Inflation

Structural inflation refers to inflation linked to the economic growth process. This is because the structural alterations brought about by the process—which are essential for development—create disequilibria. Theorists contend that inflation and economic

development are often related, particularly in emerging nations when institutional and structural barriers are genuine. Additionally, there is a long-term trend for inflation, particularly in the industrialized western nations. This is mostly due to the disparities in the rates of productivity development between the industrial and service sectors. The process of competition to maintain total income, total real spending, and total production leads to inflation.

6. 2.2.1.4 Foreign Inflation

This kind of inflation affects economies that depend heavily on imports of products and services. The dumping of products as inputs or final output in the importing country may be the cause of this inflation. The local economy is impacted by the high costs of these imported items, which gives rise to an inflationary tendency. Numerous pathways have been found for the transmission of inflation; if feasible, augmenting the domestic supply of goods and services to keep up with the increasing demand would be one of the most effective anti-inflationary policies in Nigeria. Nonetheless, one significant barrier that has to be addressed is the inelastic demand for products from outside. In the short term, refining crude oil domestically might help oil-producing nations like Nigeria manage inflation; in the long run, this would require reorganizing the economy into a more structured framework. Import inflation may be reduced with effective exchange rate management.

2.2.2 Exchange Rate Theories

The connection between exchange rates and inflation is covered by a number of theories. The following four hypotheses are often cited:

2.2.2.1 Parity in Purchasing Power (PPP)

The Salamanca School of Spain in the sixteenth century is credited with giving rise to the notion of buying power. Classical economics of the nineteenth century, such as Ricardo, Mill, Goshen, and Marshall, established and supported PPP theories, although with some qualification. Swedish economist Gustav Cassel is credited with developing and popularizing the theory's empirical version in the 1920s, giving rise to its contemporary form. The reciprocal of one country's price level versus another is used to calculate the buying power exchange rate between any two nations. The nominal exchange rate should represent the purchasing power of one currency relative to another. Furthermore, the fundamental principle of the PPP is that the equilibrium exchange rate is directly related to the relevant purchasing power parity of the national currencies involved, meaning that changes in exchange rates will undermine a nation's purchasing power and have a substantial negative impact on trade and investment[20]. Free trade requires that the nominal exchange rate between two nations match the ratio of the two nations' respective price levels[21].

According to this method, variations in the nominal exchange rate tend to balance out movements in the relative prices since equilibrium real exchange rates are assumed to stay constant throughout time. Two equilibrium rate systems are defined by the

purchasing power theory and parity theory. The first is the exchange rate that would occur in a totally freely floating exchange rate balance, which is known as the short run equilibrium exchange rate. The second is the long-run equilibrium, which would produce the equilibrium of payments over a period of time in which cooperating parties would cooperate. Cyclical variations in the balance of payments, such as those resulting from the relative purchasing power of a currency's exchange rate, are typically linked to arbitrage issues and expectations in the goods market. However, several of the presumptions made by PPP theory are very implausible and unclear. For example, various nations have varying levels of efficiency, which results in deferred cost functions that need to be supported[22.]

The idea of buying Power Parity (PPP) posits that in the long term, exchange rates have to fluctuate in order to achieve parity between the buying power of various currencies. According to PPP, a nation's currency should weaken in order to bring about balance if its inflation rate is greater than that of its trade partners. According to this theory, variations in exchange rates are a reflection of national inflation disparities.

2.2.2.2Theory of Interest Rate Parity (IRP):

According to IRP theory, the exchange rate is determined by the differential in interest rates between two nations. IRP states that a nation's currency should weaken in order to offset the greater return that investors might get if it has a higher interest rate than another. As rising inflation often results in higher interest rates, changes in exchange rates under IRP theory may be related to inflation expectations.

2.2.2.3 The Asset Market Method

Asset Market Methodology: According to the asset market method, investors' judgments of the relative merits of various assets in various nations have an impact on exchange rates. According to this idea, inflation influences interest rates and the projected returns on financial assets, which in turn has an indirect effect on exchange rates. Increased interest rates may arise from rising inflation, which can lower the appeal of a nation's assets to foreign investors and cause the value of that nation's currency to decline.

2.2.4. The Conventional Flow Model

The balance of payment model is another name for the conventional flow model. In this scenario, when supply and demand for foreign currency are equal, the exchange rate is in equilibrium[11]. The demand for foreign currency is contingent upon the domestic people' need for domestic products and assets, and exchange rates are adjusted accordingly. Relative income influences the exchange rate under the flow model, based on the assumption that domestic income primarily determines international requests for domestic commodities. Given that the demand for assets may be attributed to the difference in interest rates between local and international sources, this framework also identifies other significant factors influencing the exchange rate.

According to this idea, a country's balance of payments determines the currency's exchange rate under free exchange rates. The exchange rate increases when there is a positive balance of payments, and it decreases when there is a negative balance of payments[23]. Therefore, the theory suggests that supply and demand for foreign currency

control the exchange rate. The overshooting of the exchange rate objective and the possibility of non-automatic substitutability between money and financial assets are the main drawbacks of the conventional model, also known as the portfolio balance model. These drawbacks led to the birth of the monetary approach. Because of the aforementioned assumption and rationale, this research used the buying power parity and the typical flow model.

2.3 Empirical Review

2.3.1 Studies on Effect of Exchange rate on Inflation

Exchange rate has been highlighted as an inflation determining variable in a number of empirical studies that have attempted to determine the potential causes of inflation in Nigeria and elsewhere. Through the use of quarterly time series data from 1986QI–2012Q4 obtained from the CBN Statistical Bulletin and National Bureau of Statistics the impact of exchange rate volatility on inflation in Nigeria was examined[24]. The GARCH model was used in the research. The study's conclusions showed that Nigeria's inflation and currency rates were consistently volatile.

Another research used yearly time series data from 2006 to 2015 to investigate the impact of currency rate volatility on inflation in Nigeria[25]. The research tested for exchange rate volatility in Nigeria using the GARCH approach. The ARCH model was used in the study's analysis. The outcome showed that exchange rate volatility has a major impact on Nigeria's inflation rate.

Research utilizing quarterly data from 1986:01 to 2008:04 to evaluated the dynamics of Nigeria's money supply, exchange rate, and inflation rate[26]. The VEC Model was used to estimate the model. It demonstrates that the money supply and the foreign exchange rate have a long-term, negative, and substantial relationship with the inflationary rate. He contended that disruptions in the supply chain of commodities from both local and international supply outlets might account for inflation rather than the pressure of aggregate demand, which would explain the inverse relationship between money supply and price level. The research highlights that empirical inferences also indicate the existence of substantial feedback from long-term to short-term disequilibrium. Nonetheless, in Nigeria, there is a causal relationship between the money supply, exchange rate, and inflation.

Between 1970 and 2010, a researcher evaluated the connection between Nigeria's inflation and real exchange rate[27]. The outcome of the co-integration test demonstrates the long-term sustainability of the short-term link between the inflation rate and the exchange rate. This long-term association is further supported by the error correction model's indication of a reasonable rate of adjustment. The outcome demonstrated that inflation, both local and foreign, increased. The ARCH result shows that the real exchange rate and the rate of inflation are persistently volatile. There were hints that Nigeria's currency rate has been vulnerable to changes in the country's inflation rate. Therefore, in order to lessen the issue of imported inflation, policymakers should use domestic policies to enhance export and production of previously imported inputs in addition to policies that target inflation to stabilize the real exchange rate.

Another study examined the impact of Nigeria's pass-through exchange rate on inflation, monetary policy, and import rates[28]. Secondary data has been used. The data included the years 1986–2012. They made use of yearly data on import prices, interest rates, money supply, inflation, and the Nominal Effective Exchange Rate Index published by the Central Bank of Nigeria (CBN), as well as World Bank data on the Oil Price Index from World Development Indicators. The study used an autoregressive model of the six-variable vector to evaluate the variance decomposition and the function of the impulse response. Through their investigation, they learned that throughout the time period they looked at, Nigeria's exchange rate was low and transient in the case of inflation and moderate, significant, and constant in the case of import prices. They also found that the pass-through exchange rate was not perfect, but it did aid policymakers a lot, especially when it came to creating and carrying out monetary and exchange rate policies.

Research was done on the relationship between Nigeria's overall price level and the foreign exchange rate[29]. Finding the relationship between Nigeria's inflation rate and the official and black market foreign currency rates was the explicit goal. The analysis included the Granger causality approach and correlation. The results indicate that the association between the percentage of imports and the overall level of prices is more significant. In contrast, it was shown that the association with the black-market rate was not as significant.

A study looked at how the foreign currency rate affects imports and consumer pricing in Nigeria[30]. We gathered and analyzed quarterly historical data from 1995 to 2015 using vector error correction and Johansen co-integration. The findings suggest that imports

would be more significantly impacted by the currency rate pass-through effect than by Nigeria's overall inflation rate. The analysis comes to the conclusion that Nigeria's aggregate inflation rate does not fully reflect the foreign exchange rate. In order to evaluate the link between the exchange rate and consumer prices in Nigeria, another research created a structural vector autoregressive[31]. The results of variance decomposition analysis showed that the country's food inflation is influenced by the exchange rate. This demonstrates how the currency rate has influenced Nigeria's increasing inflation.

Historical data covering the years 1986 to 2010 was used to investigate the impact that exchange rate fluctuations have on inflation in Nigeria[32]. The vector error correction approach is the unit of analysis employed in the estimate. The findings suggest that the foreign exchange rate is affected by inflation in a nonlinear way. This suggests that a rise in the overall level of prices causes the foreign exchange rate in Nigeria to decline.

In a different study, the impact of currency rate depreciation on inflation in Nigeria from 1986 to 2018 was investigated using the Auto Regressive Distributed Lag (ARDL) Co-integration Procedure[33]. The research found that real gross domestic product, money supply, and exchange rate depreciation are the main factors influencing inflation in Nigeria. It also found that the depreciation of the Naira is positive and has a significant long-term influence on the country's inflation. This implies that an increase in Nigeria's inflation rate may result from an exchange rate depreciation.

Additionally, different research looked at the relationship between monetary policy, pass-through exchange rates, and price stability in Nigeria[34]. The multi-linear regression

approach was used in the investigation. Their findings lead one to the reasonable conclusion that Nigeria's total price level is unstable in relation to a nominal exchange rate, which prevents one-to-one exchange rate pass-through. The study's overall finding, however, was that the exchange rate's pass-through and implementation capabilities are crucial, especially when assessing the pass-through exchange rate's impact on monetary policy and price stability in Nigeria.

Similar to this, another research examined the impact of general price level on real foreign exchange rate fluctuation in Nigeria using quarterly data from 1970 to 2014[35]. The money supply, foreign exchange rate, imports as measured by import inflation, and the rate of inflation were the variables used. Granger causality and generalized autoregressive conditional heteroskedasticity were the methods used to analyze the collected historical data. According to the GARCH findings, the actual foreign exchange rate's conditional variance was susceptible to lag, the preceding period error term, and other research factors. The actual foreign exchange rate and the general price level have a one-way causal relationship, according to the causality findings. It also became clear that there was a connection between Nigeria's money supply, actual foreign exchange rate fluctuations, and imports.

An international research project looked at how Switzerland's inflation rate was affected by exchange rate volatility[36]. The European Central Bank provided the research with quarterly data from 2000: Q1 to 2016: Q4. For the analysis, the research used the Structural Vector Auto Regressive (SVAR) approach. The research's conclusions showed that the study region experienced inflationary pressure as a result of exchange rate

fluctuation. Additionally, the Granger causality approach was used to examine the link between South Sudan's inflation and foreign exchange rate[37]. We gathered and calculated monthly historical data from August 2011 to November 2014. The findings suggest that fluctuations in foreign currency rates contribute to a rise in South Sudan's inflation rate. It also became clear that the link was one-way, meaning that changes in prices did not influence changes in South Sudan's foreign exchange rate. This suggests that the price of foreign currency will rise in tandem with the country's declining buying power.

Another research used yearly time series data from 1980 to 2015 from Central Bank of Brazil to investigate the impact of currency rate volatility on inflation in Brazil[38]. Both the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH (1,1)) and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH (1,1) models were used in the research to estimate volatility. The study's conclusions demonstrated that the exchange rate's volatility had substantial persistence when analyzed using GARCH (1,1) and EGARCH (1,1).

ARDL, DOLS, and FMOLS have shown that the exchange rate has a negligible impact on inflation in Ghana over the short-run[39]. The exchange rate changes in this study's two distinct periods of short- and long-run did not significantly explain variations in the inflation rate, according to the researcher's use of the Pool Mean Group (PMG) and the Generalized Method of Moment (GMM) on Asian countries. Lastly, research looked at the dynamic relationship between changes consumer prices and the volatility of the foreign currency rate in Zambia[40]. The structural vector auto regression approach was used to gather and estimate secondary data that covered the years 1995 to 2014. The

results show that Zambia's overall inflation rate is significantly influenced by the foreign currency rate. The research also claimed that the factors influencing the nation's foreign exchange rate changes are to blame for this impact.

2.3.2 Studies on Asymmetric Effect of Exchange Rate on Inflation

Numerous investigations have been conducted in this field, with proven results. Certain results are in accord with one another, while others are not. The occurrence of asymmetric impacts of currency rate fluctuations and imported inflation in Nigeria was verified by research that took into consideration the asymmetric effect of exchange rate pass through in their analysis[41]. Additionally, partial or incomplete pass-through was verified in the short run. Another research looked at the relationship between the disaggregate consumer prices in Nigeria from 1976 to 2015 and the exchange rate. The findings of the Autoregressive Distributed Lag (ARDL) approach show that, across all disaggregate models the currency rate is the major factor driving consumer prices[42]. In a different study, utilizing quarterly data, a team of researchers used vector autoregressive (VAR) models to investigate the unequal impact of currency rate fluctuations on consumer prices in Nigeria from 2000 to 2017. The results show that changes in currency rates have a symmetric and considerable impact on food costs in Nigeria[43].

Similar to this, other researchers looked at Nigeria's 1981–2017 inflation data and the asymmetric link between exchange rate and inflation. The analysis' findings showed that Nigeria's food inflation is positively and significantly impacted by the money supply and exchange rate[44]. Furthermore, ARDL, FMOLS, and DOLS were used in research to demonstrate a strong symmetric influence of exchange rate on inflation in Nigeria38.

Similarly, different research that using VECM on data from Nigeria found that the exchange rate had an asymmetric impact on inflation in the nation over an extended period of time[45].

Additionally, a researcher used yearly time series data for the years 1997–2016 to examine the unequal influence of currency rate volatility on Nigeria's inflation rate[46]. To create the nominal exchange rate volatility series, a GARCH model was used. The long-term association between variables was found using the ARDL bounds test method. To determine which way the variables were causally related, the Granger causality test was also used. According to the research, exchange rate asymmetry has a negative short-term impact on inflation but no long-term effects.

Another research used quarterly time series data from 1986QI-2012Q4 obtained from the CBN Statistical Bulletin and National Bureau of Statistics to examine the symmetric influence of exchange rate on inflation in Nigeria[47]. The GARCH model was used in the research. The study's conclusions showed that Nigeria's inflation rate and exchange rate had a consistent symmetry impact. Another comparable research used yearly time series data from 2006 to 2015 to investigate the symmetric impact of currency rate on inflation in Nigeria. The ARDL approach was used in the research to assess the symmetry of the Nigerian exchange rate[48]. The ARDL model was used in the study's analysis. The outcome showed that Nigeria's inflation rate was highly impacted by exchange rate symmetry.

Additionally, a team of researchers used yearly time series data from 1981 to 2018 to examine the asymmetric impact of real exchange rate on inflation in Nigeria[49]. The

results showed that trade openness, government spending, interest rates, and the lagged exchange rate had positive and significant effects on real exchange rate volatility during the study period using Generalized Auto-regressive Conditional Heteroskedasticity (GARCH) techniques and the Error Correction Model (ECM).

Several scholars used both linear and non-linear ARDL methods in a similar manner[50]. They used quarterly data from Nigeria from 1960 to 2017 and discovered that, both in the short and long periods, exchange rate volatility had an uneven effect on inflation in Nigeria. The money demand was steady prior to the introduction of nonlinearity. In a similar vein, another research used the NARDL approach and utilized yearly data from 1968 to 2016 in Saudi Arabia[51]. According to their findings, real US dollar depreciation had a negative impact on inflation whereas real appreciation had a favorable one. Furthermore, another study in Nigeria used quarterly data from 1993 to 2012 and the vector error correction test[52]. They discovered that there was no asymmetric impact of exchange rate volatility on inflation in poor nations. Additionally, they discovered that the inflation function was unstable in underdeveloped countries.

A team of academics looked at the asymmetric effects of exchange rate volatility on inflation from 1985 to 2015 across a sample of 45 developing and rising nations[53]. For the analysis, the research used the generalized autoregressive conditional heteroskedasticity (GARCH) model. The results showed that inflation is significantly and asymmetrically impacted by both the nominal and real exchange rates.

In a similar spirit, another study looked at how exchange rate volatility asymmetrically affected inflation in Switzerland[54]. The European Central Bank provided the research

with quarterly data from 2000: Q1 to 2016: Q4. For the analysis, the research used the Structural Vector Auto Regressive (SVAR) approach. The research's conclusions showed that the study region experienced inflationary pressure as a result of exchange rate fluctuation. Additionally, another research used yearly time series data from 1980 to 2015 from Central Bank of Brazil to investigate the impact of asymmetric exchange rate volatility on inflation in Brazil[55]. Both the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH (1,1)) and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH (1,1) models were used in the research to estimate volatility. The study's conclusions demonstrated that the exchange rate's volatility had substantial persistence when analyzed using GARCH (1,1) and EGARCH (1,1).

Using yearly time series data for the years 1990 to 2012, research examined the impact of asymmetric exchange rate volatility on aggregate exports for two small nations, Croatia and Cyprus[56]. The investigation used the Autoregressive Distributed Lag (ARDL) model, and the findings showed that exchange rate volatility had a positive and substantial impact on exports from Cyprus and Croatia. Different research examined 18 African economies using the non-linear ARDL technique[57]. They discovered that the short-run impacts of exchange rate fluctuations on inflation are unequal. Only a small number of African nations, nonetheless, were able to convert asymmetrical impacts from the short to the long term. Similarly, another research showed that exchange rate changes asymmetrically influenced inflation in the long and short terms by using the NARDL approach to data from developing nations (India, Indonesia, Korea, the Philippines, and Singapore)[58].

Equatorial Guinea, the Gambia, Nigeria, and Uganda are African countries where a researcher used the error correction model estimates from Q2 1993 to Q4 2012 and discovered that the interest rate and exchange rate volatility had no impact on inflation in emerging nations[59]. It was discovered that their study's inflation function was also unstable. Related research that used the NARDL method to look at India's data from April 2004 to November 2015 found that the short- and long-term impacts of the rupee's strengthening and depreciation on inflation were asymmetric[60].

Another study utilized data from Korea Q3 1973 to Q3 2014 and used both linear and non-linear ARDL techniques[61]. They proved that there was a statistically significant and asymmetric short-term beneficial impact of the exchange rate. Moreover, the impact was statistically and substantially adverse. The exchange rate had an asymmetric impact, as demonstrated by the difference in the sizes of the elasticities, although both the positive and negative long-term effects of the fluctuations had a positive sign. Lastly, a team of researchers estimated quarterly data in Japan from 1973 to 2014 using the NARDL technique, and they discovered that exchange rate swings had asymmetric long-term consequences[62].

Some authors in order to establish the influence of inflation and currency depreciation on a country's economy examined the effects of both indicators and their interactive effect of the country's performance in the regulation era between 1986 to 2019, using the autoregressive distributed lag estimation technique. The empirical findings reveal that the interaction of inflation and exchange rate has a negative impact on the economy in the short run, but it is positive in the long run. Thus, the monetary authority should

proactively control the foreign exchange rate movement to curtail the recent surge in inflation and boost the performance of the country's economy[63].

This study examines the impact of exchange rate variations on inflation in Nigerian economy between 1979 and 2008. This study made use of Ordinary Least Square (OLS) regression in analyzing the impact of exchange rate variations on inflation in Nigeria. There are also other variables that determine the impact of exchange rate on inflation in Nigeria in the last 30 years by evaluating the relationship between government expenditure, money supply, exchange rate and inflation as the dependent variables. This revealed a strong relationship between inflation rate and government expenditure and a negative relationship between exchange rate and inflation.

Viewing the continuous significant depreciation of Nigeria currency, an author setting out to achieve the main objective of investigating on a more recent basis, effects of exchange rate on domestic price level in Nigeria. The period covered was from January 2015 through December 2022. The study adopted the Autoregressive Distributed Lag (ARDL) model and the variables included consumer price inflation, nominal exchange rate, import prices, international crude oil prices and real output growth. We found insignificant positive impact of the nominal exchange rate on consumer price inflation in Nigeria. The import prices also proved a significant effect on consumer price inflation in Nigeria. The study recommends that Governments at all levels in the country should encourage and support the innovative ideas of business firms and individuals. This will support local production, hence, there can be substitution of imported goods for domestically produced goods and the exchange rate will be stable [64].

Some authors in Nigeria estimate a nonlinear augmented New Keynesian Philips Curve for Nigeria using the Smooth Transition Regression model for the period 1995Q1 to 2018Q2. The empirical evidence reveals the existence of two inflation regimes during the period under review. Food inflation, energy inflation, firms' marginal cost, and imported inflation account for most of the changes in the prices of composite consumers' basket in low exchange rate depreciation regime. However, the exchange rate solely explains price changes in the composite consumers' basket when inflation switches to high regime. Similarly, the results show that regime change in inflation is largely caused by exchange rate (transition variable) depreciation or devaluation of the naira. Furthermore, the paper finds that the threshold in exchange rate devaluation (depreciation) that triggers a regime switch from low to high inflation regime is about N75 relative to a dollar. The speed of regime switch was found to be significantly high at about 70% per quarter. The paper argues that achieving exchange rate stability is a necessary condition for disinflation during this regime. Therefore, this paper recommends that monetary policy response to low inflation regime must target the various components of the consumption basket while effort to curtail persistent high inflation must include a stable exchange rate of the naira[65].

Over the years, exchange rate has been an unstable in the Nigerian economy, despite the stabilization policies introduced by successive governments in the country. This has consequently affected the prices of food products in the country. This study employed the Non-Linear ARDL model to examine the asymmetric effects of exchange rate on food inflation in Nigeria, using quarterly data from 2008Q1 to 2020Q4. The results of bounds testing to Cointegration indicate that there is a long-run relationship between exchange

rate and food inflation along with GDP. In addition, both in the long-run and short-run, there is a significant and asymmetric positive relationship between exchange rate and food inflation. GDP is found to be negative and significant relationship on food inflation. Based on these findings, this study recommends that the Central Bank of Nigeria (CBN) should continue to improve the operations of the foreign exchange market to enhance its liquidity. Moreover, the CBN should apply tight monetary policies of price stability to help sustain low food inflation rate. In addition, government through the CBN should create policy to ensure easy and direct access to foreign exchange (FOREX) by individual and businesses. Lastly, Firms should continue to produce goods which help to reduce the rate of importation despite unstable exchange rate in Nigeria[66].

The unstable condition of Nigerian Naira due to the import-dependent nature of the economy and its over-reliance on oil revenues prompted some authors to carry out this study. The feedback effect of exchange rate pass-through inflation on sustainable development in Nigeria is the aim of the study. Annual time series data over the period of 1980 to 2018 from Central Bank of Nigeria statistical bulletin were collected and the Structural Vector Autoregressive (SVAR) estimation technique was employed in the analysis. The outcome indicates that inflation had a significant positive impact on sustainable development while interest rate has a negative significant impact on inflation in Nigeria. The study concluded that inflation had a positive, substantial influence on sustainable development and that the exchange rate had a long-term inflation relationship. The study therefore, recommends that excess dependency on primary commodities as a source of foreign exchange should be minimized by ensuring that value

is added to all primary commodities before being traded abroad to reduce the country exposure to disturbances in the international commodity markets and improve the value of the local currency[67].

An author study examined the effect of exchange rate volatility on inflation in Nigeria using annual time series data covering the period 1986-2019. To achieve this objective, the study employed the generalized autoregressive conditional heteroskedasticity (GARCH) and vector error correction model (VECM) to ascertain the long-run impact of exchange rate volatility on inflation. The study used consumer price index as a proxy for inflation being the dependent variable while nominal exchange rate (NER), money supply (MS) import (IMP) and export (EPT) were used as the independent variables. The results of stationarity test indicated that the variables have mixed order of integration and bounds test for co-integration confirmed the existence of a long-run relationship among the variables. Findings showed that money supply (MS) and nominal exchange rate(NER) had positive and significant effect on consumer price index, meaning that inflation in Nigeria is caused by exchange rate fluctuations as well as increase in money supply. Based on the findings, the study recommended that growth of money supply should be controlled by the central bank in order to reduce inflation to the barest minimum. [68]

In Nigeria, regrettably, exchange rate has continued to maintain steady disequilibrium trend over the years and its stability in the near future seems not to be possible given the unfavorable macroeconomic conditions such as high inflation rate, interest rate differentials, depletion of foreign reserves, structural deficiency in the economy which are among the factors responsible for exchange rate depreciation in Nigeria. This

prompted an author to carry out an investigation on the effect of exchange rate volatility and the relative effectiveness of monetary and fiscal policies on economic growth of Nigeria for the period 1981-2018 with specific objectives.; to determine the effect of exchange rate volatility on economic growth in Nigeria, to ascertain the relative effect of monetary policy on economic growth in Nigeria, to investigate the relative effect of fiscal policy on economic growth in Nigeria and to determine the joint effects of monetary and fiscal policies on economic growth in Nigeria. The specified model was estimated using the Autoregressive Distributive lag Model to determine the level of impact that one variable has on the other. While E-views 10 statistical software was employed in computing the result, time series data were obtained from World Bank national accounts data and OECD National Accounts data files and the study established that Exchange Rate Volatility (EXRVT) is ineffective on its effect and influence on economic growth (RGDP) of Nigeria, Broad Money Supply (LM2)had a negative a positive relationship with economic growth (RGDP) in the short run and in the long run at 5% level of significance while Inflation Rate (INFR) had a negative and statistical relationship with RGDP in the current year and also in the long run at 5% level of significance and finally, Total Government Expenditure (LTGEXP) had a negative relationship with RGDP in the short run and in the long run but statistically insignificantly at 5% level of significance. Based on the findings, the study recommended that efforts should be made to ensure exchange rate stability in order to stabilize Nigeria's economy and that they government should do everything economically possible to strengthen the value of Naira in the FOREX market. This however excludes pumping billions of dollars into the FOREX market as this only creates a temporary economic condition. [69]

This study is an investigation into the effect of foreign exchange rate unification on inflation, price stability and foreign investment. The study adopted a survey approach. Primary data was collected using questionnaire. The study employed PLS-SEM to examine the impact of foreign exchange rate unification on inflation, price stability and foreign investment. The study found that inflation, price stability and foreign investment are all influenced by exchange rate unification. The study concludes that exchange rate unification has adverse impact on price stability, highlighting the presence of short-term difficulties during the transition period. The study recommends that punitive measures and strict political discipline must be exercised to check unethical practices that may undermine the primary objectives of foreign exchange rate unification[70].

Currency fluctuations and inflation are the natural norm for most major economies. Numerous factors influence economic growth, including a country's exchange rate system performance, the outlook for inflation, and interest rate differentials. These are the most significant factors that hinder the economic growth of every nation. Based on this, an author investigated the impact of exchange rate and inflation on Nigeria's growth performance from 1986 to 2021. Impulse response and variance decomposition were estimated. The real gross domestic product (RGDP) was used as a proxy for growth performance, while the inflation rate (IFNR), real exchange rate (REXR), and interest rate (INTR) were also used as proxies. The results of impulse response and variance decomposition estimates in the short-run (third quarter) and long-run (tenth quarter) show that real exchange rate D(REXR), INTR, and IFNR all have a positive impact on RGDP variation, with values of 13.38%, 31.88%, and 22.40%, respectively, in the third quarter. In the long run (the 10th quarter), REXR contributed approximately 28.76% of the

variation in RGDP. The interest rate contributed 24.14%, while the IFNR has contributed about 28.27% of the variation in RGDP in the long run. Therefore, summing the contributions of REXR, INTR, and INFR to RGDP, these variables contributed about 81.17% of the variation in RGDP in the long run. Hence, the research concluded that REXR, INTR, and IFNR have a positive effect on growth performance as proxied by RGDP in Nigeria within the period of the research. The research recommended that the government should provide a policy that will reduce the excess growth of aggregate demand (AD) in the economy, which will reduce inflationary pressure, in order to achieve the sustainable development goals (SDGs) of 2030 in Nigeria, which include restoring economic growth and macroeconomic stability through macroeconomic variables such as the exchange rate, inflation, and other significant variables[71].

The dynamic relationship between exchange rate movements (appreciation and depreciation) and macroeconomic fundamentals had preoccupied the minds of researchers across the globe. Consequently, extensive research works have been conducted to unravel the puzzle; however, the findings remain inconclusive. The inconclusiveness of these researches may not be unconnected with the choice of model, the omission of key variables and erroneous assumption of symmetric interrelationships of the variables. To mitigate such error and fill the observed research gaps, an author leveraged on the non-linear autoregressive distributed lag to trace the possible asymmetric pass-through of the exchange rate to output growth in Nigeria. The study made use of monthly time series for the period 2000M1–2018M12 for empirical estimations. The empirical findings reveal an asymmetric pass-through from exchange rate to productivity. Exchange rate depreciation led to output retardation in the short run,

but neither appreciation nor depreciation of the exchange affected output in the long run. The findings highlight that exchange rate depreciation of the local currency does not improve the country's productivity. This reveals a disconnection and misalignment between exchange and productivity in Nigeria. The findings call for proper alignment of the Naira exchange rate with the U.S. dollar for improved productivity in the economy[72].

Some authors investigated the effect of real exchange rate volatility on the productive sector of Nigeria economy (1999-2021) using secondary data from Statistical bulletin of Central Bank of Nigeria. The research work used Vector Autoregression Estimate (VAR) to test the effect between the independent variables (real exchange rate volatility, balance of trade and inflation rate) on the dependent variable (productive sector). The study found that exchange rate volatility has significant effect on productive sector of Nigeria economy. Thus, the study recommends among others that Nigeria should have a single exchange rate for all sectors of the economy having multiple exchange rates for different sectors should be avoided. In addition, the official foreign exchange market should be made available to all sectors of the economy especially the productive sector. Equally the monetary authority should endeavor to monitor the foreign exchange market on a regular basis and implement policies that will prevent Naira fluctuation in order to maintain exportation of Nigeria's products and services and instill confidence in Nigeria's trading partners. There is need also to diversify Nigeria economy while reducing the lending rate in the country[73].

Another group of authors examine the interactions between the general price level and foreign exchange rate in Nigeria with the aim of ascertaining if inflation was imported via

the foreign exchange rate in Nigeria. The theoretical underpinning of this study was anchored on the purchasing power parity theory. The ex-post facto research design was adopted to observe the study variables in retrospect. Thus, historical data covering 1990 to 2018 was collated and estimated employing the error correction technique. The test results indicates that foreign exchange rate exert a positive and insignificant influence on the level of inflation in Nigeria. This stand to suggest that a benign level of change in the general price level is caused by imported inflation. Evidence further indicates that lending interest rate exerts a negative and significant impact on the level of inflation in Nigeria. The study concludes that persistent increase in foreign exchange rate stimulate increase in the general price level, whilst that of the lending interest rate has no bearing on the general price level in Nigeria. The policy implication of this is for the monetary authorities to ensure foreign exchange rate stability to avoid imported inflation. Also, the lending interest rate be made attractive enough to drive aggregate demand and not too unattractive to slow down aggregate demand. The study therefore recommends a stable and strong international and domestic value of the naira via a policy of stability[74].

2.4 Gaps of Literature Reviewed

It is evident from the literature analysis that there are not many studies that have examined the asymmetric effect of exchange rate on Nigerian inflation. This study contributes to knowledge by examining the asymmetric effect of exchange rate on inflation in Nigeria. This research is one of the very few that examines the asymmetric effect of exchange rate on inflation in Nigeria. The approach, variables utilized, and theoretical framework also adds to the body of current literature. As opposed to earlier

research that uses the standard deviation to quantify volatility and determine how much the exchange rate varies over time relative to its mean, this study fills a significant gap by providing a logical analysis to evaluate the asymmetric effect of exchange rate on inflation using the Non-linear Autoregressive Distributed Lag Model (NARDLM). The study also examines the response of inflation to shocks in exchange rate

2.5 Theoretical Framework

The theoretical foundation on which the relationship between prices and exchange rates is based evolves from the doctrine of purchasing power parity (PPP), an offshoot of the law of one price (LOOP), with the assumptions that there are no trade barriers and transport costs. However, in real world situations, trade frictions exist and these distort the underlying assumptions of PPP. Notwithstanding these developments, the law of one price is still useful in understanding the relationship between prices and exchange rates. This relationship, linking the domestic price to exchange rate, follows from the LOOP which states that in the absence of trade frictions and under conditions of free competition and price flexibility, identical goods sold in different locations must sell for same price when prices are expressed in a common currency.

Therefore, at equilibrium, the prices of tradable goods in two markets are not expected to differ when expressed in the same currency and thus, guaranteeing a complete pass-through. Thus, a change in domestic currency in a market would have equal change in price in the other market, even though the markets are in two different countries. Algebraically, PPP with no transport costs and tariffs can be written thus:

$$P_t^{\alpha}=EXC_tP_t^*\_\_\_\_\_(2.4)$$

where Pt represents domestic price at time t, Pt ∗ stands for the world import price and EXCt is the nominal exchange rate.

However, because of trade frictions, the LOOP may or may not hold in certain instances. This is based on the fact that many factors such as cost of production, producers' mark up and exchange rate movements influence domestic import prices. The principle of PPP is the macroeconomic counterpart to the microeconomic LOOP. While LOOP relates exchange rates to the relative prices of an individual good, PPP relates exchange rates to the relative prices of a basket of goods. Both theories are used as theoretical background of exchange rate pass-through depending on whether the emphasis is at firm level or at macroeconomic level.

Many arguments have been made to cast doubt on the veracity of the law of one price's assertions, particularly when it comes to marketplaces within the same nation. First, when import items are directly priced using current exchange rates, there's a chance that differences in local costs might be significant. When items are transported across borders at a cost higher than zero, this possibility may be explained. In addition, taxes vary from nation to nation, and when imports are translated straight at the current exchange rate, non-tradable input changes might account for a substantial portion of the wide fluctuations in local pricing. Thus, from an aggregate and global viewpoint, one may argue that the buying power parity hypothesis is the application of the law of one price.

The law of one price (LOP), which stipulates that the price of similar goods offered in various markets should be the same when translated into the same currency serves as the foundation for the investigation of the relationship between exchange rates and domestic pricing.

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Chapter Three

Research Methodology

In any research work, the procedure to be adopted by the researcher is determined by the problem being investigated and the objective of the study. This chapter delves into the methodology to be adopted in the study. “Research method can be seen as the specification of the procedure for collecting and analyzing the data necessary to solve the problems at hand, such that the difference between the cost of obtaining various levels of accuracy and the expected value of the information associated with each level of

accuracy is minimized"[1]. This chapter contained the model specification, data source and definitions, a-priori expectation, estimation technique and model evaluation.

3.1 Model Specification

The objectives of the study are to examine the effect of exchange rate on inflation in Nigeria. The dependent variable is inflation and the independent variable is exchange rate while other control variables such as money supply, GDP per capita, import prices, and interest rate are also employed. The conceptual representation of the model is given as follows:

INF= f (EXC, GDP/CAPITA, IMPORT, MS, INT) …….…. (3.1)

Where:

INF= Inflation rate (annual consumer prices %)

EXC= Official Exchange Rate (N/US$)

IMPORT = Import Prices

INT = Interest Rate (annual Interest Rate)

GDP/CAPITA = Gross Domestic Product Per Capita

MS- Money Supply

The econometric representation of the first model becomes:

$INF= \alpha_0 + \alpha_1 lnEXC + \alpha_2 lnGDP/CAPITA + \alpha_3 lnIMPORT + \alpha_4 INT + \alpha_5 LNMS + \mu$…….. (3.2)

Where:

α_0 = Constant of the regression model.

α_1= Coefficient of log of exchange rate in the model (keeping other variables constant).

α_2= Coefficient of log of GDP/Capita (keeping other variables constant).

α_3= Coefficient of log of import prices (keeping other variables constant).

α_4= Coefficient of interest rate in the model (keeping other variables constant).

α_5= Coefficient of log of money supply in the model (keeping other variables constant).

μ= Error term (capture exogenous factors)

The econometric representation of the second model becomes:

$$\text{INF} = \alpha_0 + \alpha_1 \text{LNEXC}^+ + \alpha_2 \text{LNEXC}^- + \alpha_3 \text{LNGDP/CAPITA} + \alpha_4 \text{LNIMPORT} + \alpha_5 \text{INT} + \alpha_6 \text{LNMS} + \mu \text{ ---------- } (3.3)$$

Where:

α_0 = Constant of the regression model.

α_1= Coefficient of log of an increase in exchange rate in the model (keeping other variables constant).

α_2= Coefficient of log of a decrease in official exchange rate in the model (keeping other variables constant).

α_3=Coefficient of log of GDP/Capita (keeping other variables constant)

α_4= Coefficient of the log of import prices (keeping other variables constant).

α_5= Coefficient of interest rate in the model (keeping other variables constant).

α_6= Coefficient of log of money supply (keeping other variables constant).

μ= Error term (capture exogenous factors)

3.2 Data Source and Definition

Table 3.1: Data Sources and Definition

S/N	Variables	Label	Description	Source	A-priori Expectation
1.	Dependent Variable	Inflation	Inflation rate (annual consumer prices). This refers to the percentage change in the prices of basket of goods and services.	World Development Indicators (2022)	
2.	Independent Variable	Exchange Rate	This refers to the rate of exchange of one country's currency (naira) to another	World Development Indicators (2022)	The coefficient of exchange rate could be positive or negative depending on whether it depreciated or

			country's currency (dollars).		appreciated.
3.	Control Variable	Interest Rate	This refers to interest rate spread(lending minus deposit rate)	World Development Indicators (2022)	The coefficient of interest rate could be positive or negative dependingon whether it increased or reduced.
4.	Control Variable	Money Supply	Broad money measures the total volume of money supply in the economy	Central Bank of Nigeria Statistical Bulletin. (2022)	The relationship between money supply and inflation is expected to be positive following the monetarist theory of higher money supply culminating in higher inflation.
5.	Control Variable	Import Prices	This is measured by the value of major imports	Central Bank of Nigeria Statistical Bulletin. (2022)	The relationship between import prices and inflation is expected to be positive
6.	Control Variable	GDP/Capita	Gross Domestic Product (GDP) per capita shows a country's GDP divided by its total population.($)	World Development Indicators (2022)	Positive

Source: Author's Illustration (2024)

3.3. Pre-Estimation Tests

3.3.1 Unit Root Test

The unit-root test will be adopted to test the time-series properties of the data. The Augmented-Dickey Fuller test is employed in testing the unit-root properties of the data.

3.3.2 Co-integration Test

In order to investigate the cointegration relationship between the variables of interest, the Autoregressive Distributed Lag (ARDL) and Non-Linear Autoregressive Distributed Lag (NARDL)bounds test are applied. This cointegration approach, proposed by Pesaran et al. (2001), has several key advantages: First, this method tests for cointegration between variables integrated of order zero i.e. I(0) and order one i.e. I(1). The Bound test for cointegration will be used to determine whether there is long-run relationship between the variables of interest. The co-integration test will be tested at 5% level of significance. It is based on the null hypothesis of no cointegration against alternative hypothesis of cointegration as set below which can be determined using the Wald or F-statistics. If co-integration is established, we can proceed to run an ARDL or NARDL model.

3.4. Estimation Technique

3.4.1. Auto-Regressive Distributed Lag Method (ARDL)

In analyzing the effect of exchange rate on inflation in Nigeria, the Autoregressive Distributed Lag (ARDL) and Non-Linear Autoregressive Distributed Lag (NARDL)models are employed. The ARDL approach yields consistent estimates of the long-run coefficients that are asymptotically normal, irrespective of whether the underlying regressors are I(1) or I(0), and also works well with small samples. Similarly, the test is based on a single ARDL equation, rather than on a VAR, thus reducing the number of parameters to be estimated. Finally, it estimates simultaneously the long-run and short-run parameters. NARDL model on the other hand decomposes the independent variable into its positive and negative partial sums.

The ARDL model for the first objective is given as:

$$INF_t = \sum_{i=1}^{n} \beta_1 \Delta lnEXC_{t-1} + \sum_{i=1}^{n} \beta_2 \Delta lnGDP/CAPITA_{t-1} + \sum_{i=1}^{n} \beta_3 \Delta lnIMPORT_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta INT_{t-1} + \sum_{i=1}^{n} \beta_5 \Delta lnMS_{t-1} + \alpha_1 lnEXC_{t-1} + \alpha_2 lnGDP/CAPITA_{t-1} + \alpha_3 lnIMPORT_{t-1} + \alpha_4 INT_{t-1} + \alpha_5 lnMS_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots 3.4$$

The NARDL model for the second objective is given as:

$$INF_t = \sum_{i=1}^{n} \beta_1 \Delta lnEXC_{t-1}^{+} + \sum_{i=1}^{n} \beta_2 \Delta lnEXC_{t-1}^{-} + \sum_{i=1}^{n} \beta_3 \Delta lnGDP/CAPITA_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta lnIMPORT_{t-1} + \sum_{i=1}^{n} \beta_5 \Delta INT_{t-1} + \sum_{i=1}^{n} \beta_6 \Delta lnMS_{t-1} + \alpha_1 lnEXC_{t-1}^{+} + \alpha_2 lnEXC_{t-1}^{-} + \alpha_3 lnGDP/CAPITA_{t-1} + \alpha_4 lnIMPORT_{t-1} + \alpha_5 INT_{t-1} + \alpha_6 lnMS_{t-1} + \mu_t \ldots\ldots 3.5$$

Where β_1 to $\beta_6$are the short run coefficients and α_1 to $\alpha_6$are the long run coefficients of the variables.

3.4.2. VAR Variance Decomposition and Impulse Response Function

In order to ascertain how inflation will react to unforeseen fluctuations in the exchange rate, the variance decomposition and impulse response function from VAR are used. The graphs of the impulse response functions provide further insight into the short-term interactions between the variables. When analyzing time series data, IRF analysis plays a significant role in identifying how external innovations impact the system's variables (i.e.,

how an unexpected change in one variable at the beginning influences another variable across time).

Endnotes

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Chapter Four

Results and Discussion of Findings

This chapter presents the results of the empirical analysis between exchange rate and inflation in Nigeria from 1986 to 2022. The analysis presents the linear and non-linear

long-run and short-run relationship between exchange rate and inflation in Nigeria. This Chapter includes preliminary analysis including descriptive analysis, correlation matrix as well as other econometric analysis.

4.1. Preliminary Tests

Some preliminary tests are conducted to summarize the data, give information about the order of integration of the variables employed as well as test whether or not cointegration exists among the variables.

4.1.1. Descriptive Statistics

This is done to summarize the basic features of the data. The results of the descriptive statistics are presented in Table 4.1.1.

Table 4.1: Descriptive statistics

Variable	Mean	Std Dev	Max.	Min.	Kurtosis	Skewness	Jarque-Bera	Prob.
INF	19.325	17.343	72.835	5.388	4.862	1.777	24.834	0.000
EXC	4.193	-0.776	5.991	0.703	2.443	-0.776	4.199	0.122
GDP/CAPITA	7.564	0.240	7.893	7.260	1.287	-0.002	4.518	0.104

MS	7.508	2.428	10.604	3.169	1.760	-0.320	3.002	0.222
INT	7.057	2.264	11.064	0.724	4.430	-0.984	9.137	0.010
IMPORT	14.178	2.287	16.924	8.696	2.540	-0.758	3.873	0.144

Source: Author's Computation (2024)

The table shows that all the variables have positive mean values. Exchange rate has the highest mean value, while interest rate has the lowest mean value. The table also shows some variables are exemplified by a marked disparity, given their maximum and minimum values. In terms of their disparity from the average points, the standard deviation values are relatively low for money supply and interest rate. The table also presents the result of other statistics like the skewness, Kurtosis and Jarque–Bera tests. Skewness is a measure of asymmetry of the distribution of the series around its mean. The skewness of a normal distribution is zero, while positive and negative skewness imply long right tails and long left tails respectively. The skewness test shows that all the variables, except inflation are negatively skewed. For the kurtosis test, it measures the presence of outliers in the dataset. The results indicate that all the variables are not normally distributed as they failed to comply with the benchmark of 3.0 for the Kurtosis statistic. Exchange rate, GDP per Capita, import prices and money supply are statistical distributions less than 3(platykurtic) while interest rate and inflation are statistical distributions which are greater than 3 (leptokurtic).

4.2. Correlation Matrix

The correlation matrix shows the association between variables. It explains the degree of association existing among the variables, whether positive or negative. It is also used to know the level of multicollinearity in the model analyzed.

Table **4.2: Correlation matrix**

	INF	*EXC*	GDP/CAPITA	*MS*	*INT*	*IMPORT*
INF	1					
EXC	-0.4082	1				
GDP/CAPITA	-0.4474	0.1653	1			
MS	-0.4367	0.5642	0.1779	1		
INT	0.0794	0.5853	0.3314	0.5197	1	
IMPORT	-0.4047	0.6605	0.4944	0.0381	0.6068	1

Source: Author's Computation (2024)

The table shown above depicts the correlation matrix for the first model. However, there is no correlation coefficient that exceeds or is even close to 0.70. For this reason, in this model, there is no problem of multi-collinearity which enhanced the reliability for regression analysis. All the variables except interest rate have negative correlation with inflation. Conversely, all the variables (GDP per capita, money supply, interest rate, import price) have a positive correlation with exchange rate. Positive correlation was also recorded between interest rate and money supply as well as import prices and money supply.

4.3. Unit Root Test

The unit root test is essential in order to ensure that the variables are estimated in their stationary forms to avoid spurious result. To do this, the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) tests are employed. The essence is to test the null hypothesis of unit root or non-stationary stochastic process. To reject this, the ADF and PP statistic must be more negative than the critical values at either 1%, 5% & 10% significance levels respectively.

Table 4.3: Unit root test result

Variables	Augmented Dickey Fuller (ADF)		Phillip-Perron (PP)		
	Levels	**1st Difference**	**Levels**	**1st Difference**	Decision value
INF	-2.930	-5.685***	-2.801	-9.848	I(1)
EXC	-1.500	-4.099***	-1.306	-4.130	I(1)
GDP/CAPITA	-0.748	-3.921***	-0.918*	-3.836***	I(1)
MS	-0.693	-7.141***	0.046	-7.941	I(1)
INT	-3.313***	----------	-3.615	----------	I(0)
IMPORT	-3.564***	----------	-1.9502	-7.661***	I(0)
			CRITICAL VALUES		
1%	-3.615	-3.621	-3.627	-3.621	
5%	-2.941	-2.943	-2.945	-2.943	
10%	-2.609	-2.610	-2.611	-2.610	

Source: Author's Computation (2024)

Table 4.3.1 shown above reports unit root test for all our variables using the ADF and PP Test. Interest rate and import prices are integrated of order zero 1(0), while inflation, exchange rate, GDP/Capita and money supply are integrated of order one I (1). This justifies our choice of ARDL and NARDL methodology as variables exhibit a mix of integration order 1(0) and 1(1).

4.4. Bound Test for Linear Co-integration

In this study we test the null hypothesis by means of F-statistics, given that:

Null Hypothesis H_0: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = 0$

Alternative Hypothesis H_1: $\varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq 0$

The upper and lower boundaries of the two crucial values are compared to the F-statistic value. When all the variables are integrated of order one, or I (1), the upper limit is applicable, and when all the variables are integrated of order zero, or I (0), the lower bound is applicable. The hypothesis stating that there is no co-integration is rejected if the computed F-statistics value is greater than the upper limit. The null hypothesis cannot be ruled out if the computed F-statistics value is less than the lower limit critical value. However, if the computed F-statistics are within the crucial boundaries, no firm conclusion on co-integration can be drawn.

Since the limits test corrects for residual serial correlation, it is more effective for small sample sizes and may be used even in cases where variables exhibit endogenous features.

Table 4.4.1: Bound Test Result for ARDL:

Test Statistic	Value	K
F-statistics (inf| exc, gdp/capita, ms, int, import)	9.025	5
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.08	3.00
5%	2.39	3.38
2.5%	2.70	3.73
1%	3.06	4.15

Source: Author's computation (2024).

Table 4.4.2: Bound Test Result for NARDL:

Test Statistic	Value	K
F-statistics (inf| exc^+, exc^-, gdp/capita, ms, int, import)	17.443	6
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	1.99	2,94
5%	2.27	3.28
2.5%	2.55	3.61
1%	2,88	3.99

Source: Author's computation (2024).

The Bound-Test for linear co-integration for the ARDL model is shown in Table 4.4.1, as previously mentioned. This method is used to determine if the variables being utilized have a long-term relationship (co-integration). To reject the null hypothesis that there is no co-integration, one must ensure that the F-Statistic is higher than both the lower and upper bounds at 1%, 5%, or 10%. We may therefore conclude that there is a long-term relationship between the variables since the computed F-Statistic (9.520) is higher than the upper limit at 1%, 5%, and 10%.

Similarly, Table 4.4.2. reports the Bound-Test for non- linear co-integration for the NARDL model. To reject the null hypothesis that there is no co-integration, one must ensure that the F-Statistic is higher than both the lower and upper bounds at 1%, 5%, or 10%. We may therefore conclude that there is a long-term relationship between the variables since the computed F-Statistic (17.443) is higher than the upper limit at 1%, 5%, and 10%.

4.5. ARDL Estimation Results

4.5.1. Effect of Exchange rate on Inflation in Nigeria

Results of the ARDL are reported in this section. This explains the effect of exchange rate on inflation in Nigeria. The short and long-run estimates for all variables are presented using the ARDL framework.

Table 4.5: Effect ofExchange rate on Inflation in Nigeria

Dependent Variable: Inflation(INF)
Selected Model: ARDL(2, 2, 3, 2, 3, 0)
Sample:1986 2022 **Included observations:** 33

Short-Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	0.616675	0.084228	7.321457	0.000
D(LNEXC)	-12.02969	3.709850	-3.242636	0.005
D(LNEXC(-1))	-12.86311	3.915520	-3.285160	0.005
D(LGDP_CAPITA)	8.94960	35.01517	0.255592	0.801
D(LGDP_CAPITA(-1)	-275.8007	39.54248	-6.974795	0.000
D(LGDP_CAPITA(-2)	-114.3897	40.36366	-2.833976	0.012
D(LNIMPORT)	23.05163	3.719704	6.197168	0.000
D(LNIMPORT(-1)	-6.073333	3.615092	-1.679994	0.112
D(LNMS)	-30.40197	11.76445	-2.584223	0.020
D(LNMS(-1))	26.82400	9.413907	2.849401	0.012
D(LNMS(-2))	18.98386	10.51122	1.806056	0.089
ECT(-1)	- 0.649842	0.058649	-11.08017	0.0000

Long-run Estimates

LNEXC	9.142058	5.743094	1.591835	0.1310
LGDP_CAPITA	58.15364	34.76899	1.672572	0.1138
LNIMPORT	13.59944	8.745781	1.554972	0.1395
INT	-0.044578	0.918275	-0.04854	0.9619
LNMS	-25.76354	12.10651	-2.128073	0.0492
C	-457.0296	291.2590	-1.569152	0.1362

R-squared 0.897 **D-Watson** 2.09
Adj. R-squared 0.846

Diagnostic Tests

Serial Correlation: 0.877256 [0.4376] **HeteroskedasticityTest:** 0.56532[0.8731]

Source: Author's Computation (2024)

The short run ARDL result above indicates that inflation in the one lagged period affects the current level of inflation positively and significantly at 1 percent. The value of the coefficient shows that a percentage increase in the one lagged value of inflation will

increase current inflation by 0.62 percent. Conversely, exchange rate in the current period as well as the immediate past period have negative and significant effect on inflation at 1 percent. A percentage increase in exchange rate in the current and one lagged period will reduce inflation by 12.0 and 12.9 percent respectively. Similarly, per capita GDP in the one and two lagged periods also have reducing effects on inflation and the relationship is significant at 1 percent. The coefficient estimate reveals that a percentage increase in the one and two lagged values of GDP per capita will reduce inflation by 275 and 114 percent respectively. Import prices has a significant and positive relationship with inflation at 1 percent significance level. This indicates that a 1 percent increase in the price of imported goods will increase inflation by 23 percent.

Money supply in the current, one and two lagged periods have significant relationship with inflation at different levels of statistical significance. The current value of money supply has a negative relationship with inflation and is statistically significant at 5 percent showing that a percentage increase in money supply in the current period will reduce inflation by 30 percent. Money supply in the one and two lagged periods exhibit positive association with inflation and are significant at 5 and 10 percent respectively. Results show that a percentage increase in money supply in these periods will increase inflation by 26 and 18 percent respectively.

The error correction term is statistically significant, negative and less than one. This means that the speed of adjustment from short-run to long –run equilibrium given any shock in the model is about 64 percent.The coefficient of determination (Adjusted-R^2) is

high (85%) indicating that about 85% of the total variations in inflation was explained by the variables in the model.

For the long run estimates, money supply has a negatively significant relationship with inflation. A percentage increase in money supply will reduce inflation by 26 percent. However, exchange rate, GDP per capita, import prices and interest rate do not significantly affect inflation in the long run.

Post Estimation Diagnostic Test on Model I

Post Estimation diagnostic tests are carried out after estimating the ARDL result to validate findings. For the Breusch-Godfrey serial correlation test, since the probability value (0.87) is greater than 0.05, we conclude that there is no evidence of serial correlation in our estimation. For the Breusch-Pagan Godfrey Heteroskedasticity test, since the probability value (0.56) is greater than 0.05, we conclude that there is no evidence of heteroskedasticity in our estimation. The stability tests were also examined with the CUSUM and CUSUMSQ tests. Results showed that the parameters estimated are stable for the period analysed.

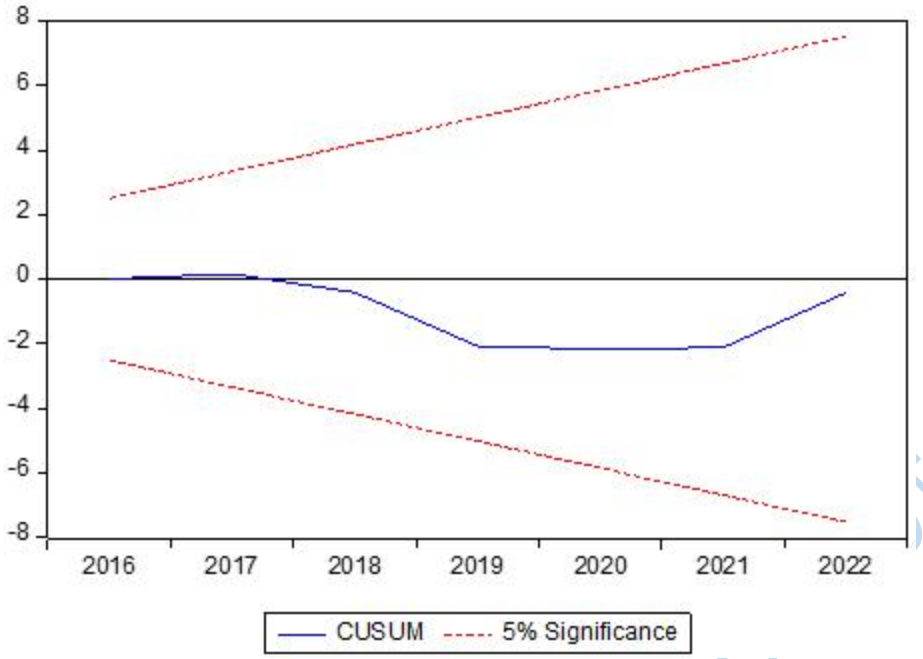

Figure 4.1: CUSUM for ARDL model
Source: Author's Computation (2024)

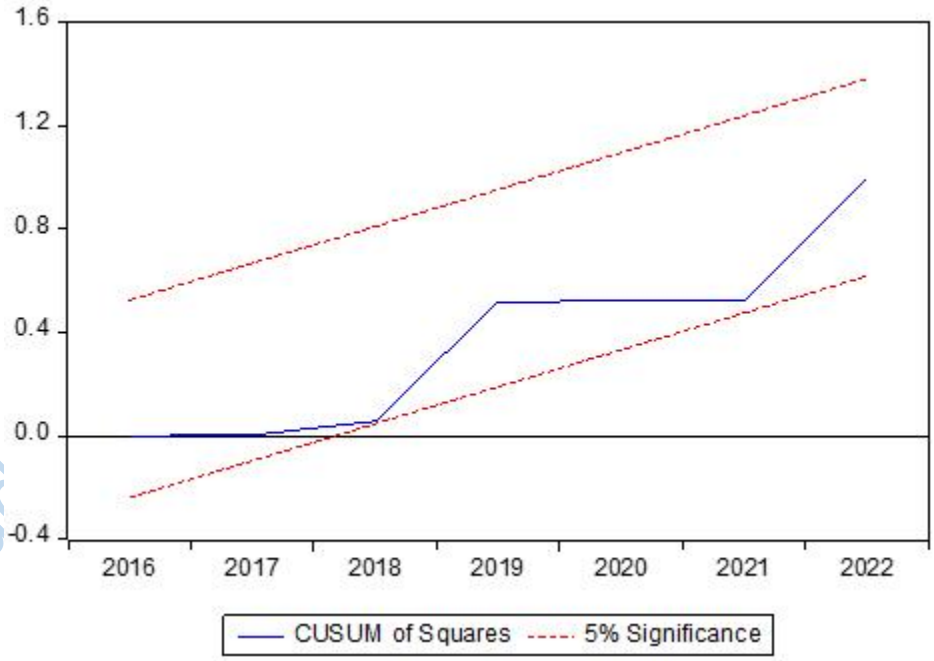

Figure 4.2: CUSUM OF SQUARES for ARDL model
Source: Author's Computation (2024)

4.6. NARDL Estimation Results

4.6.1.Asymmetric Effect of Exchange rate on Inflation in Nigeria

In estimating the asymmetric effect exchange rate on inflation in Nigeria, the NARDL results are shown below:

Table 4.7: Asymmetric Effect ofExchange rate on Inflation in Nigeria

Dependent Variable: Inflation(INF)
Selected Model: ARDL((2, 3, 2, 3, 2, 3, 3)
Sample:1986 2022 **Included observations:** 33

Short-Run Estimates				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INF(-1))	0.265444	0.046726	5.680880	0.0005
D(LNEXC_POS)	14.13359	2.430546	5.814984	0.0004
D(LNEXC_POS(-1))	-48.78542	3.620508	-13.47474	0.0000
D(LNEXC_POS(-2))	-18.85129	2.795583	-6.74323	0.0001
D(LNEXC_NEG)	-341.9012	46.87753	-7.293497	0.0001
D(LNEXC_NEG(-1))	-152.6455	61.91289	-2.465487	0.0390
D(LGDP_CAPITA)	19.24196	22.47175	0.856273	0.4168
D(LGDP_CAPITA(-1))	-384.2384	25.69975	-14.95106	0.0000
D(LGDP_CAPITA(-2))	-275.3566	33.28174	-8.273505	0.0000
D(LNIMPORT)	20.70656	1.993529	10.38688	0.0000
D(LNIMPORT(-1)	-8.601578	1.881879	-4.570738	0.0018
D(LNMS)	-91.54173	9.409809	-9.728331	0.0000
D(LNMS(-1))	28.15978	6.654860	4.231461	0.0029
D(LNMS(-2))	44.63547	7.558149	5.905608	0.0004
D(INT)	-0.478260	0.354017	-1.350951	0.2137
D(INT(-1))	-2.809728	0.354798	-7.919243	0.0000
D(INT(-2))	-4.057857	0.367215	-11.05036	0.0000
ECT(-1)	- 1.088	0.058649	-11.08017	0.0000
Long-run Estimates				
LNEXC_POS	63.93847	14.49401	4.411371	0.0023
LNEXC_NEG	-514.6704	110.2018	-4.670253	0.0016
LGDP_CAPITA	126.7051	46.31968	2.735450	0.0256

LNIMPORT	22.58835	8.350845	2.704918	0.0269
INT	5.087759	2.598490	1.957968	0.0859
LNMS	-87.05603	19.09405	2.704918	0.0019
C	-887.8733	361.7791	-2.454186	0.0397

R-squared	0.981	**D-Watson**	1.592
Adj. R-squared	0.959		

Diagnostic Tests	
Serial Correlation: 1.280759 [0.3442]	**HeteroskedasticityTest:** 0.584430 [0.8529]

Source: Author's Computation (2024)

From the short run and long run estimates, it is evident that asymmetries exist in the relationship between exchange rate and inflation. In the short run, the one lagged value of inflation has a positive and significant relationship with the current level of inflation. An increase in the one lagged value of inflation will increase current inflation by 0.26 percent. Similarly, positive exchange rate in the current period has a positive and significant effect on inflation. This means that a percentage increase in exchange rate in the current period will increase inflation by 14 percent. Conversely, positive exchange rate in the one and two lagged periods have significant and negative effect on inflation. This shows that a percentage increase in exchange rate in the one and two lagged periods will reduce inflation by 48 and 18 percent respectively.

Negative exchange rate in the current and one lagged period have negative and significant relationship with inflation at 1 and 5 percent. A percentage decrease in exchange rate in the current and one lagged period will reduce inflation by 341 and 152 percent respectively. Similarly, GDP per capita in the one and two lagged periods have

significant and negative relationship with inflation. A percenatge increase in GDP per capita in these periods will reduce inflation by 384 and 275 percent respectively.

Import prices in the current and one lagged periods have significant relationship with inflation at 1 percent. While the relationship is positive in the current period, it is negative in the one lagged period. A percentage increase in import prices in the current period will increase inflation by 21 percent, while a percentage increase in import prices in the one lagged period will reduce inflation by 8 percent.

Money supply in the current, one and two lagged periods have significant relationship with inflation at 1 percent. The relationship is negative in the current period, showing that a percentage increase in money supply will reduce inflation by 91 percent. Money supply in the one and two lagged periods have positive relationship with inflation. A percentage increase in money supply in these periods will increase inflation by 28 and 45 percent respectively.

Interest rate in the one and two lagged periods exhibit negative and significant effect on inflation at 1 percent. A percentage increase in interest rate in these periods will reduce inflation by 3 and 4 percent respectively. The error correction term is statistically significant, negative but greater than one. This shows oscillatory convergence and means that the speed of adjustment from short-run to long –run equilibrium given any shock in the model is about 108 percent. The coefficient of determination (Adjusted-R2) is high (96%) indicating that about 96% of the total variations in inflation was explained by the variables in the model.

For the long run estimates positive and negative exchange rate values, GDP per capita, import prices, interest rate and money supply have significant effect on inflation. While positive exchange rate has a positive effect on inflation, negative exchange rate has a negative effect on inflation. A percentage increase in exchange rate will increase inflation by 63 percent in the long run, while a percentage decrease in exchange rate will reduce inflation by 514 percent in the long run.

4.6.2. Post Estimation Diagnostic Test on NARDL Model

Some diagnostic tests are carried out after estimating the NARDL result to validate findings. For the Breusch-Godfrey serial correlation test, since the probability value (0.34) is greater than 0.05, we conclude that there is no evidence of serial correlation in our estimation. For the Breusch-Pagan Godfrey Heteroskedasticity test, since the probability value (0.85) is greater than 0.05, we conclude that there is no evidence of heteroskedasticity in our estimation. The stability tests were also examined with the CUSUM and CUSUMSQ tests. Results showed that the parameters estimated are stable for the period analysed.

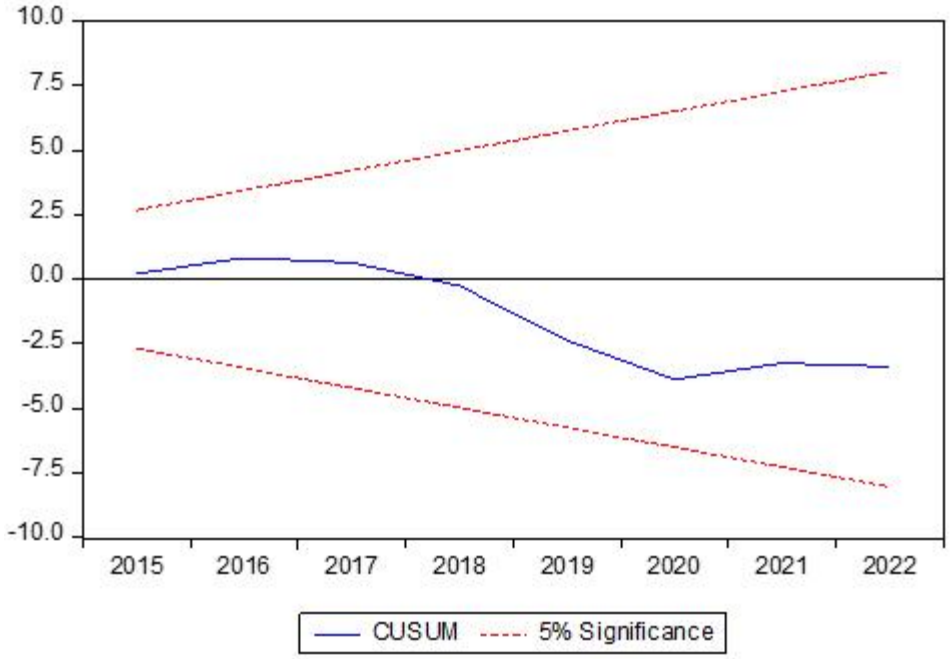

Figure 4.3: CUSUM for NARDL model
Source: Author's Computation (2024)

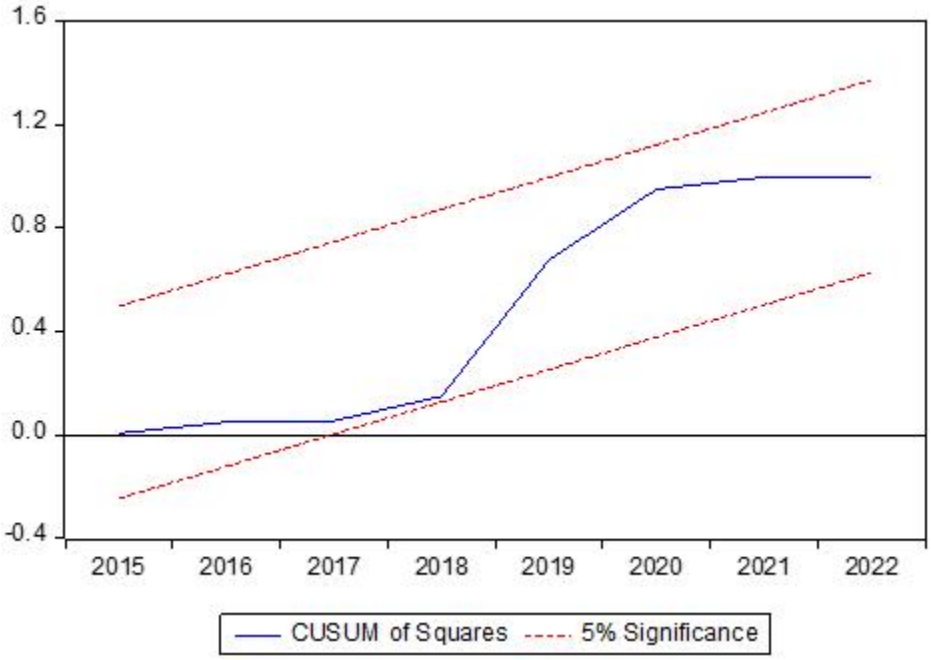

Figure 4.4: CUSUM OF SQUARES for NARDL model
Source: Author's Computation (2024)

4.7. Impulse Response and Variance Decomposition to evaluate the response of inflation to shocks in Exchange Rate

4.7.1. Impulse Response test

Impulse response functions (IRFs) show the effects of shocks on the adjustment path of the variables in the VAR model. IRFs can be graphically presented showing the effect of shocks on the current and future path of the variables under consideration. In essence, IRs show how these variables react to different shocks in the model. In the impulse response graphs, the solid blue lines show the responses of the endogenous variables to an innovation, while the dashed lines indicate the boundaries of 95% confidence intervals. If both the upper bound and the lower bound limit does not cross the zero line, then an innovation to an endogenous variable under consideration has no effect on the that particular variable (meaning the innovation is not statistically significant).

Also, the effect of a one -time innovation is regarded as transitory shock if the variable shows a tendency to converge to zero; but if it does not, then it is considered to be a permanent shock. The IRF graphs below show the response of inflation to shocks in exchange rate.

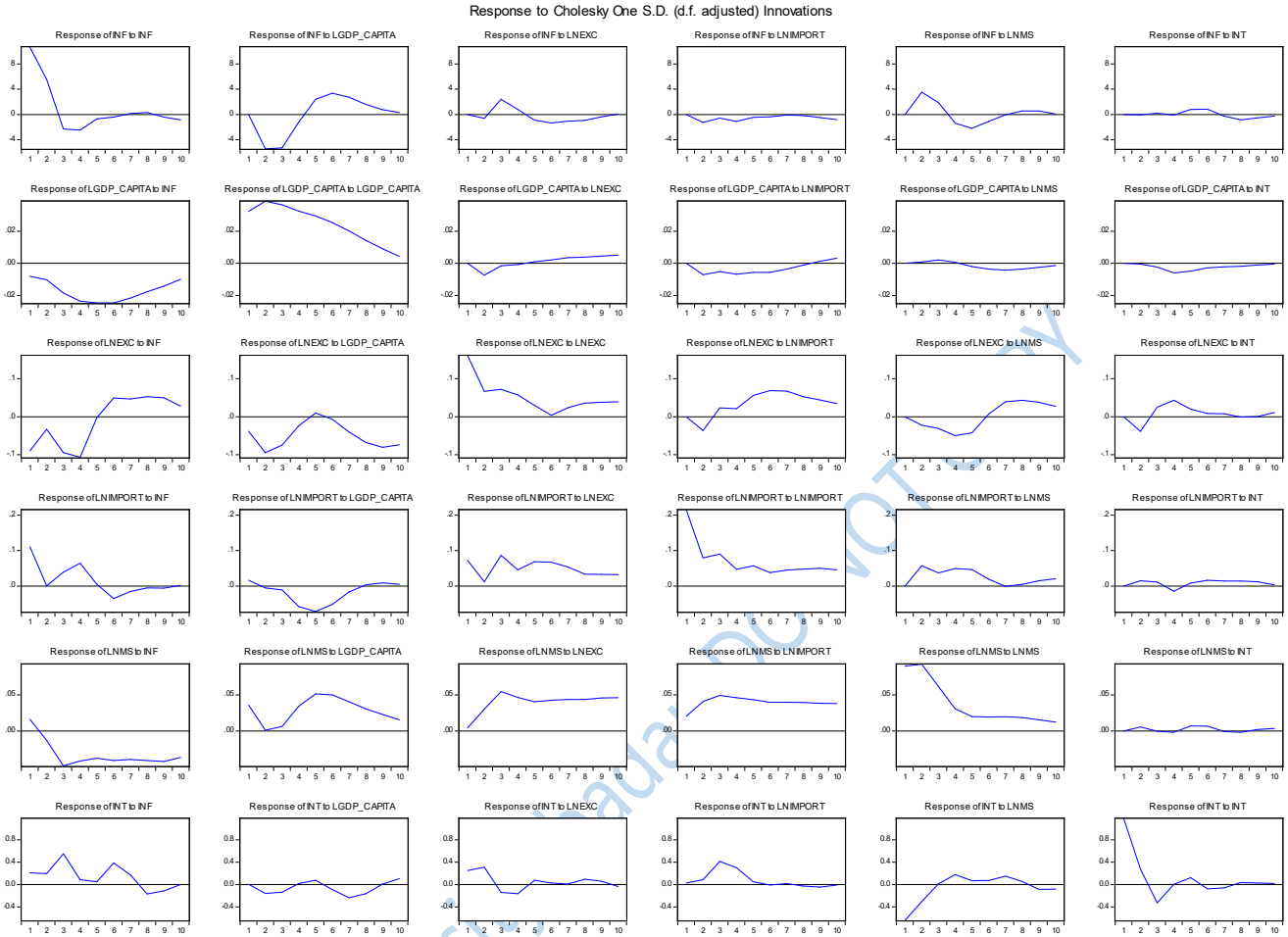

Fig. 4.5: Impulse response

Source: Author's Illustration (2024)

The figure shown above depicts the response of inflation to a one standard deviation shock of exchange rate. It shows that the shocks to exchange rate are statistically significant and exert negative effect on inflation in most periods. A shock to exchange rate causes inflation to be mean reverting in the first ad second period. Inflation increases again slightly in the third and fourth periods The fifth to ninth period are negative before converging to the mean in the tenth period. It can therefore be concluded that shocks to exchange rate majorly have negative effects on inflation.

For GDP per capita, the response of inflation to a one standard deviation shock shows that the first to fourth periods are witnessed by an increase in inflation before converging to the mean in the fifth period. However, the sixth to ninth period show evidence of an increase in inflation following a standard deviation shock in GDP per capita and in the tenth period, it converges to zero.

For import prices, the first to tenth periods show that the response of inflation to a one standard deviation shock is entirely negative. The response of inflation to a one standard deviation shock in money supply is positive between the first and third periods before reverting to zero in the fourth period. The response becomes negative in the fifth to seventh periods and again converges to the mean between the eight and tenth periods. For the response of inflation to a one standard deviation shock in interest rate is mostly zero reverting and slightly negative in the latter period.

4.7.2. Variance Decomposition Analysis

Variance Decomposition test is used to analyze the percentage of unexpected variation in each variable that is produced by shocks from other variables. This test is therefore suitable for examining the effect of an unanticipated shock in exchange rate on inflation in Nigeria. The table below presents the result of the Forecast Error Variance Decomposition result.

Table 4.8: Forecast Error Variance Decomposition (FEVD) Result

Variance Decomposition: Inflation

Period	S.E	INF	LGDP_CAPITA	LNEXC	LNIMPORT	LNMS	INT
1	10.66085	100.0000	0.000000	0.000000	0.000000	0.000000	0.0000
2	13.70345	76.77729	15.59355	0.199194	0.846414	6.582990	0.000557
3	15.18930	64.75673	24.80870	2.658174	0.835229	6.922234	0.018935
4	15.55591	64.25656	24.22898	2.808330	1.283378	7.401773	0.020978
5	15.95500	61.27713	25.30237	2.991706	1.295876	8.874094	0.258823
6	16.42558	57.88339	28.05029	3.482228	1.270052	8.813924	0.500117
7	16.68610	56.10043	29.84811	3.765006	1.234666	8.542231	0.509559
8	16.82317	55.22209	30.27846	3.997224	1.225915	8.520082	0.756234
9	16.87414	54.95282	30.30045	4.016065	1.307987	8.573906	0.848774
10	16.92038	54.89725	30.17141	3.996154	1.540918	8.528191	0.866075

Source: *Author's Computation (2024)*

From the table shown above, the variance decomposition result suggests that from short run to long run, forecast error variance of inflation is mostly explained by itself and therefore exerts strong endogeneity on itself. Shocks to exchange rate accounts for about 0.199 percent of shocks to inflation in the second year, rising to 4.01 percent in the ninth year, and reducing slightly to 3.99 percent in the tenth year. The table also shows that shocks in GDP per capita accounts for 15.59 percent of shocks in inflation in the second period, and increasing to 30.17 in the tenth period.

Import price shocks also has a dismal effect on inflation, accounting for 0.85 percent of shocks in the second period and 1.54 in the tenth period. Similarly, interest rate also shows a dismal effect on inflation ranging from 0.00 in the second year to 0.8 in the tenth year.

4.8. Discussion of Findings

Findings from the study establishes both short and long run relationships. The ARDL result indicates that exchange rate, GDP/Capita, interest rate, import price and money supply have significant effect on inflation. While exchange rate, money supply and GDP per capita negatively affect inflation in the short run, import price exerts a positive influence on inflation. In the long run, exchange rate, GDP per capita, import prices and interest rate do not significantly affect inflation in the long run.

For exchange rate, results conform to a priori expectations as exchange rate depreciation is expected to increase inflation in Nigeria, given that the country is an import driven

country, it, therefore, implies that a depreciation of the exchange rate would translate to an increase in inflation[1] For the positive relationship between import prices and inflation in Nigeria, results conform with a-priori expectation. Given a largely import-dependent economy, an increase in import price will likely increase inflation. Results align with studies that have established a positive relationship between import prices and inflation[2].

The study also recorded that GDP per capita has a positive relationship with inflation in the short run. A rise in GDP per capita leads to an appreciation of the currency, it can dampen inflationary pressures by reducing the cost of imported goods and services[3].

For the asymmetric relationship, short run and long run estimates show evidence that asymmetries exist in the relationship between exchange rate and inflation. Exchange rate increase has a positive effect on inflation, while a decrease in exchange rate has a reducing effect on inflation. However, the result of the findings are not surprising because in Nigeria, whenever the domestic currency depreciates relative to that of foreign currency an increase in the rate of inflation is recorded. This can be emphasized on imported inflation and depreciation in exchange rate.

Nigeria is an import dependent nation, where imported products have taken over the domestic produced goods. In addition, the results of estimation indicate that appreciation in exchange rate has significant effect on inflation in the long-run and the short-run. A 1% appreciation in exchange rate leads to a 514% decreases in inflation in the long-run and 341% in the short-run at 5% and 1% level, respectively. This finding is in tandem with the Nigerian situation, because when the domestic currency appreciates relative to that of the foreign country, inflation is likely to reduce. This conforms with studies that

have established a negative relationship between exchange rate appreciation and inflation[4,5, 6, 7, 8.]

Endnote

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Chapter Five

Conclusion

5.1 Summary of findings

The study examined the effect of exchange rate on inflation in Nigeria., while examining both the linear and non-linear effect. The study also examined the effect of an unanticipated change in exchange rate on inflation in Nigeria. Two models were analyzed, each explaining the linear and non-linear effect of exchange rate on inflation separately. The VAR Impulse Response and Variance Decomposition techniques were employed in analysing the response of inflation to exchange rate shocks. Some interesting findings were established. The unit root test using the ADF test statistics show a mixed order of integration among the variables, thus validating the use of ARDL and NARDL estimation technique. Bound test for long run relationship was conducted for the two models and the presence of long run relationship was established. This necessitated the short run specification of the models.

However, for the first model explaining the effect of exchange rate on inflation in Nigeria, result showed that in the short run, exchange rate, GDP/Capita, interest rate, import price and money supply have significant effect on inflation. While exchange rate, money supply and GDP per capita negatively affect inflation in the short run, import price exerts a positive influence on inflation. For the long run estimates, money supply has a

negatively significant relationship with inflation. However, exchange rate, GDP per capita, import prices and interest rate do not significantly affect inflation in the long run.

For the second model explaining the non-linear effect of exchange rate on inflation, from the short run and long run estimates, it is evident that asymmetries exist in the relationship between exchange rate and inflation. In the short run, an increase in exchange rate has a positive effect on inflation, while a decrease in exchange rate has a reducing effect on inflation. Money supply and interest rate also has a negative effect on inflation. Import prices and GDP per capita also have positive relationships with inflation in the short run. For the long run estimates, a positive increase in exchange rate has a positive effect on inflation and a negative exchange rate has a negative effect on inflation. GDP per capita, import prices and interest rate have positive effects on inflation, while money supply has a negative effect on inflation.

Impulse response function show the effect of shocks in exchange rate on inflation within a VAR model. Result shows that the shocks to exchange rate are statistically significant and exert negative effect on inflation in most periods. It can therefore be concluded that shocks to exchange rate majorly have negative effects on inflation. The variance decomposition result suggests that from short run to long run shocks to exchange rate accounts for about 0.199 percent of shocks to inflation in the second year, rising to 4.01 percent in the ninth year, and reducing slightly to 3.99 percent in the tenth year.

5.2 Conclusion

This study has examined the effect of exchange rate on inflation in Nigeria by analysing both linear and non-linear models. Similarly, the study also examined the effect of

shocks in exchange rate on inflation in Nigeria. In achieving this, the ARDL, NARDL and VAR Variance Decomposition and Impulse Response tests were employed for yearly time series data spanning from 1986 to 2022. The study found that long and short run relationship exists among the variables.

For the linear effect, in the short run, exchange rate, GDP/Capita, interest rate, import price and money supply have significant effect on inflation. While exchange rate, money supply and GDP per capita negatively affect inflation in the short run, import price exerts a positive influence on inflation. In the long run, exchange rate, GDP per capita, import prices and interest rate do not significantly affect inflation in the long run.

For the non-linear effect, exchange rate increase has a positive effect on inflation, while a decrease in exchange rate has a reducing effect on inflation. Money supply and interest rate also has a negative effect on inflation. Import prices and GDP per capita also have positive relationships with inflation in the short run. For the long run estimates, a positive increase in exchange rate has a positive effect on inflation and a negative exchange rate has a negative effect on inflation. GDP per capita, import prices and interest rate have positive effects on inflation, while money supply has a negative effect on inflation. Unanticipated shocks from exchange rate to inflation are also seen to be temporary as they are mean reverting.

5.3 Recommendations

From the results of the study, the following recommendations are made:

a) An increase in exchange rate was seen to affect inflation positively, while a decease in exchange rate reduces inflation. The government and the central bank should intervene in

the foreign exchange market to stabilize the exchange rate. This could involve measures such as adjusting exchange rate policies, increasing foreign exchange reserves, or implementing currency controls to manage the demand for foreign currency.

b) Given the positive effect of import prices on inflation in Nigeria, there exists a tendency for imported inflation. Policymakers may consider adjusting trade policies to mitigate the impact of higher import prices on inflation. This could involve measures such as tariff adjustments, import quotas, or trade agreements aimed at reducing import costs and diversifying sources of imports. An Import-Substitution strategy for reducing imported inflation should be embraced. This will encourage and promote domestic production and reduce the effect of exchange rate fluctuations on inflation.

c) Following the negative influence of interest rate on inflation, a contractionary monetary policy should be maintained by the monetary authority to control inflationary pressure. This could involve increasing interest rates to reduce borrowing and spending, which can help to stabilize prices. However, this approach needs to be balanced with its impact on economic growth and access to credit.

d) Following the positive effect on GDP per capita on inflation, fiscal policy measures can be adopted to complement monetary policy in tackling inflation. Policymakers may consider adjusting government spending and taxation to reduce aggregate demand pressures. For example, reducing government expenditure or increasing taxes can help moderate inflationary pressures caused by increased consumer spending.

5.4. Contribution to Knowledge

This study contributes to knowledge by examining the asymmetric effect of exchange rate on inflation in Nigeria. Given the paucity of literature in this regard, this research is

one of the few studies that examines the asymmetric effect of exchange rate on inflation in Nigeria. The approach, variables utilized, and theoretical framework also adds to the body of current literature. As opposed to earlier research that uses the standard deviation to quantify volatility and determine how much the exchange rate varies over time relative to its mean, this study fills a significant gap by providing an econometric analysis to evaluate the asymmetric effect of exchange rate on inflation using the Non-linear Autoregressive Distributed Lag Model (NARDLM). The study also examines the response of inflation to shocks in exchange rate.

5.5. Suggestion for Further Studies

Further studies on exchange rate and inflation in Nigeria can employ a comparative analysis on the effect of official and parallel exchange rate on inflation in Nigeria. Similarly, further studies can examine the effect of different exchange rate policies on inflation in Nigeria.

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Appendix

ARDL Error Correction Regression

Dependent Variable: D(INF01)

Selected Model: ARDL(4, 4, 3, 2, 4, 3)

Case 2: Restricted Constant and No Trend

Date: 05/10/24 Time: 18:36

Sample: 1986 2022

Included observations: 33

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF01(-1))	-0.343642	0.098120	-3.502273	0.0100
D(INF01(-2))	-0.793806	0.045591	-17.41151	0.0000
D(INF01(-3))	0.442542	0.065104	6.797507	0.0003
D(LNEXC)	49.20257	5.605005	8.778326	0.0001
D(LNEXC(-1))	44.43159	4.145215	10.71876	0.0000
D(LNEXC(-2))	43.88980	4.044853	10.85078	0.0000
D(LNEXC(-3))	45.61227	4.275738	10.66770	0.0000
D(LGDP_CAPITA)	-0.896468	19.45484	-0.046079	0.9645
D(LGDP_CAPITA(-1))	-491.0107	36.61307	-13.41080	0.0000
D(LGDP_CAPITA(-2))	150.5294	18.15101	8.293167	0.0001
D(LNIMPORT)	25.05534	2.497273	10.03308	0.0000
D(LNIMPORT(-1))	-63.09096	3.791684	-16.63930	0.0000
D(INT)	-6.744377	0.731235	-9.223268	0.0000
D(INT(-1))	8.405775	0.812454	10.34615	0.0000
D(INT(-2))	0.652197	0.335814	1.942141	0.0932
D(INT(-3))	3.563951	0.454185	7.846914	0.0001
D(LNMS)	-93.04334	10.54210	-8.825885	0.0000
D(LNMS(-1))	114.2985	9.839108	11.61675	0.0000
D(LNMS(-2))	38.34448	6.926308	5.536063	0.0009
CointEq(-1)*	- 0.649842	0.058649	- 11.08017	0.0000

R-squared	0.987430	Mean dependent var	-1.071735
Adjusted R-squared	0.969059	S.D. dependent var	13.73941
S.E. of regression	2.416778	Akaike info criterion	4.883311
Sum squared resid	75.93061	Schwarz criterion	5.790285
Log likelihood	-60.57463	Hannan-Quinn criter.	5.188480
Durbin-Watson stat	2.679745		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.443861	10%	2.08	3
k 5		5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXC	-41.23279	20.98274	-1.965082	0.0901
LGDP_CAPITA	-393.0058	192.7574	-2.038862	0.0808
LNIMPORT	-146.2182	77.53343	-1.885873	0.1013
INT	20.00967	9.787865	2.044334	0.0802
LNMS	165.3131	86.99282	1.900308	0.0992
C	3908.134	1923.075	2.032232	0.0816

EC = INF01 - (-41.2328*LNEXC -393.0058*LGDP_CAPITA -146.2182

F-Bounds Test Null Hypothesis: No levels relationship

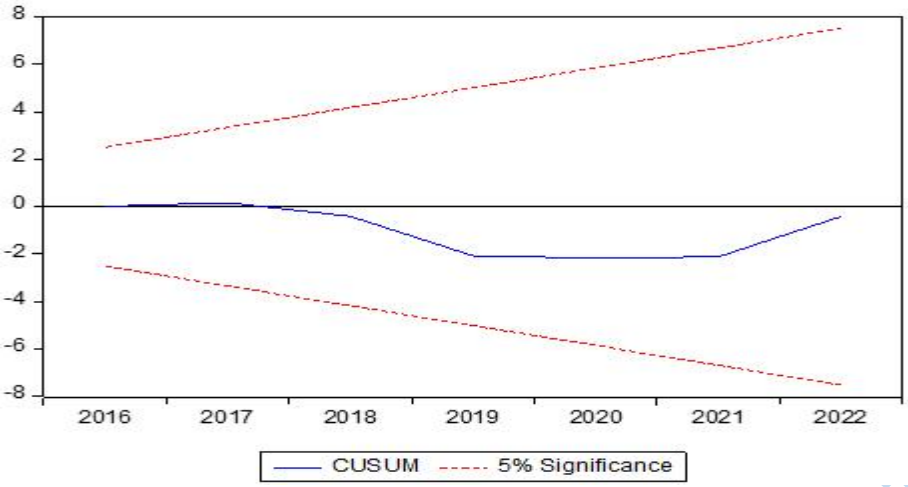
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	9.443861	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

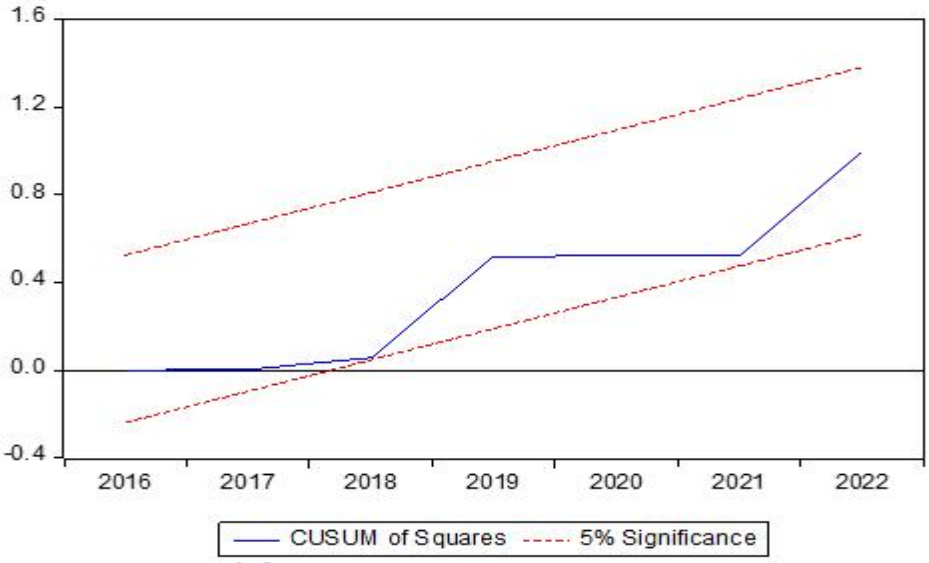
Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.953937	Prob. F(2,5)	0.4457
Obs*R-squared	9.114217	Prob. Chi-Square(2)	0.0105

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.893215	Prob. F(25,7)	0.1952
Obs*R-squared	28.74824	Prob. Chi-Square(25)	0.2746
Scaled explained SS	0.970824	Prob. Chi-Square(25)	1.0000





Dependent Variable: INF

Method: ARDL

Date: 05/10/24 Time: 18:47

Sample (adjusted): 1991 2022

Included observations: 32 after adjustments

Maximum dependent lags: 4 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (4 lags, automatic): LNEXC_POS LNEXC_NEG
LGDP_CAPITA LNIMPORT LNOIP

Fixed regressors: C

Number of models evalulated: 12500

Selected Model: ARDL(2, 4, 4, 4, 3, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF(-1)	0.755978	0.115690	6.534515	0.0013
INF(-2)	-0.928290	0.107087	-8.668535	0.0003
LNEXC_POS	-24.31710	5.809895	-4.185463	0.0086
LNEXC_POS(-1)	9.089380	4.700496	1.933707	0.1110
LNEXC_POS(-2)	18.15478	6.044490	3.003526	0.0300
LNEXC_POS(-3)	1.465985	6.296431	0.232828	0.8251
LNEXC_POS(-4)	10.81618	5.385282	2.008471	0.1008
LNEXC_NEG	-91.73268	63.14590	-1.452710	0.2060
LNEXC_NEG(-1)	-243.7316	129.6364	-1.880117	0.1189
LNEXC_NEG(-2)	264.7304	124.7189	2.122617	0.0872
LNEXC_NEG(-3)	-61.45753	124.5329	-0.493504	0.6426
LNEXC_NEG(-4)	-259.3876	88.44966	-2.932602	0.0325
LGDP_CAPITA	-40.33822	66.80935	-0.603781	0.5723
LGDP_CAPITA(-1)	-106.1989	57.66356	-1.841699	0.1249
LGDP_CAPITA(-2)	-16.11624	65.66665	-0.245425	0.8159
LGDP_CAPITA(-3)	96.66196	43.73659	2.210094	0.0781
LGDP_CAPITA(-4)	-88.75546	41.47686	-2.139879	0.0853
LNIMPORT	16.83387	4.990389	3.373259	0.0198
LNIMPORT(-1)	-32.78580	4.557364	-7.194027	0.0008
LNIMPORT(-2)	6.486446	3.834095	1.691780	0.1515

LNIMPORT(-3)	-9.385591	3.143468	-2.985744	0.0306
LNOIP	2.854213	7.168352	0.398169	0.7069
LNOIP(-1)	-8.135303	7.898290	-1.030008	0.3502
LNOIP(-2)	9.137830	7.334835	1.245813	0.2680
LNOIP(-3)	6.222637	6.122952	1.016281	0.3561
LNOIP(-4)	13.72228	6.731015	2.038665	0.0970
C	1307.673	622.1744	2.101779	0.0896

R-squared	0.995208	Mean dependent var	18.30256
Adjusted R-squared	0.970290	S.D. dependent var	16.25877
S.E. of regression	2.802468	Akaike info criterion	4.730080
Sum squared resid	39.26912	Schwarz criterion	5.966794
Log likelihood	-48.68128	Hannan-Quinn criter.	5.140016
F-statistic	39.93895	Durbin-Watson stat	2.091733
Prob(F-statistic)	0.000321		

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

selection.

Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXC_POS	12.97371	8.950696	1.449464	0.2069
LNEXC_NEG	-334.0230	97.81634	-3.414797	0.0189
LGDP_CAPITA	-132.0015	64.96561	-2.031868	0.0979
LNIMPORT	-16.08026	6.503315	-2.472625	0.0563
LNOIP	20.30319	20.58353	0.986380	0.3692
C	1115.466	474.4732	2.350956	0.0655

EC = INF - (12.9737*LNEXC_POS -334.0230*LNEXC_NEG -132.0015 *LGDP_CAPITA -16.0803*LNIMPORT + 20.3032*LNOIP + 1115.4656)

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	22.71245	10%	2.08	3

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	22.71245	10%	2.08	3
k	5	5%	2.39	3.38
2.5%	2.7	3.73		
1%	3.06	4.15		

ARDL Error Correction Regression
Dependent Variable: D(INF)
Selected Model: ARDL(2, 4, 4, 4, 3, 4)
Case 2: Restricted Constant and No Trend
Date: 05/10/24 Time: 18:54
Sample: 1986 2022
Included observations: 32

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	0.928290	0.051303	18.09431	0.0000
D(LNEXC_POS)	-24.31710	2.244031	-10.83635	0.0001
D(LNEXC_POS(-1))	-30.43695	2.732035	-11.14076	0.0001
D(LNEXC_POS(-2))	-12.28217	2.182303	-5.628077	0.0025
D(LNEXC_POS(-3))	-10.81618	2.388168	-4.529071	0.0062
D(LNEXC_NEG)	-91.73268	28.01044	-3.274946	0.0221
D(LNEXC_NEG(-1))	56.11474	46.12516	1.216575	0.2781
D(LNEXC_NEG(-2))	320.8451	50.04946	6.410562	0.0014
D(LNEXC_NEG(-3))	259.3876	41.97330	6.179824	0.0016
D(LGDP_CAPITA)	-40.33822	22.31893	-1.807355	0.1305
D(LGDP_CAPITA(-1))	8.209736	24.41379	0.336274	0.7503
D(LGDP_CAPITA(-2))	-7.906506	14.37433	-0.550044	0.6060
D(LGDP_CAPITA(-3))	88.75546	12.25811	7.240551	0.0008
D(LNIMPORT)	16.83387	1.582297	10.63889	0.0001
D(LNIMPORT(-1))	2.899144	1.550732	1.869533	0.1205
D(LNIMPORT(-2))	9.385591	1.598255	5.872398	0.0020
D(LNOIP)	2.854213	2.474017	1.153676	0.3008
D(LNOIP(-1))	-29.08275	3.453656	-8.420859	0.0004
D(LNOIP(-2))	-19.94492	3.266916	-6.105121	0.0017
D(LNOIP(-3))	-13.72228	2.346866	-5.847066	0.0021
CointEq(-1)*	-1.172312	0.062683	-18.70219	0.0000

R-squared	0.990693	Mean dependent var	0.241720
Adjusted R-squared	0.973771	S.D. dependent var	11.66633

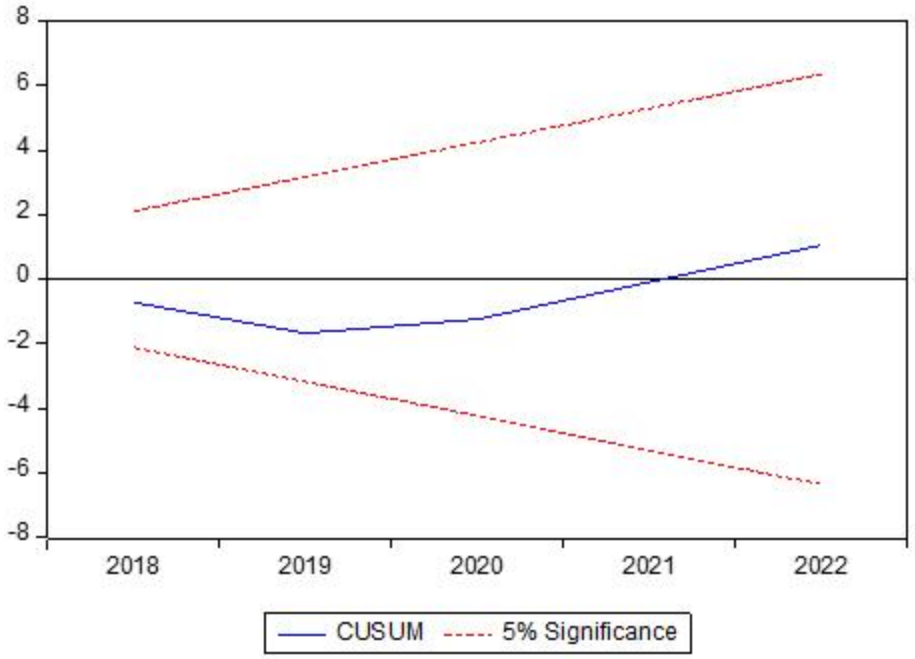
R-squared	0.990693	Mean dependent var	0.241720
Adjusted R-squared	0.973771	S.D. dependent var	11.66633
S.E. of regression	1.889423	Akaike info criterion	4.355080
Sum squared resid	39.26912	Schwarz criterion	5.316969
Log likelihood	-48.68128	Hannan-Quinn criter.	4.673919
Durbin-Watson stat	2.091733		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.218018	Prob. F(2,3)	0.8158
Obs*R-squared	4.060822	Prob. Chi-Square(2)	0.1313

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.594368	Prob. F(26,5)	0.8258
Obs*R-squared	24.17740	Prob. Chi-Square(26)	0.5658
Scaled explained SS	0.611928	Prob. Chi-Square(26)	1.0000


8
6
4
2
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-2
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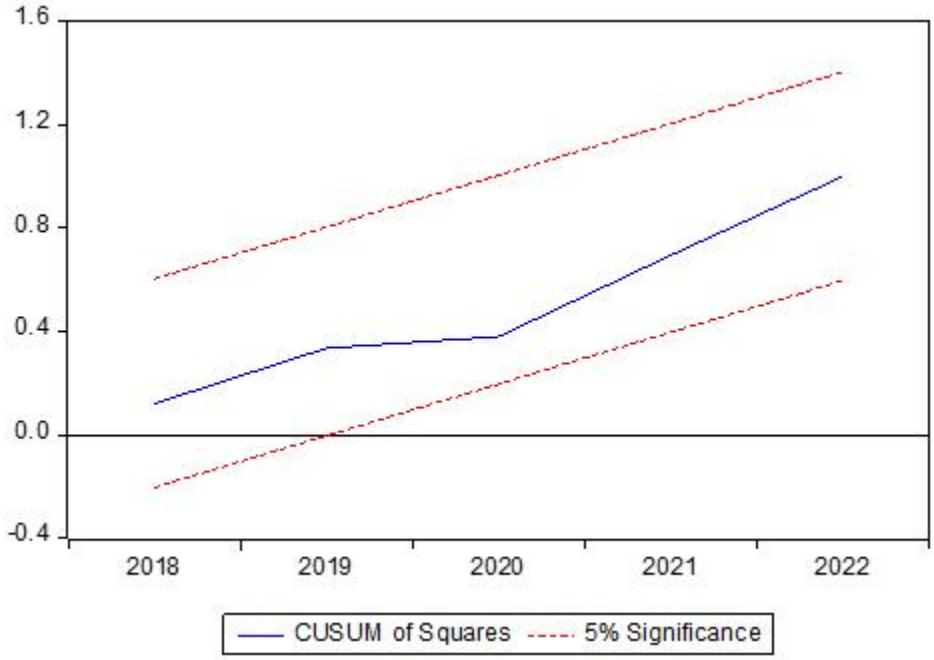
-8
2018
2019
2020
2021
2022
CUSUM
5% Significance


1.6
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CUSUM of Squares
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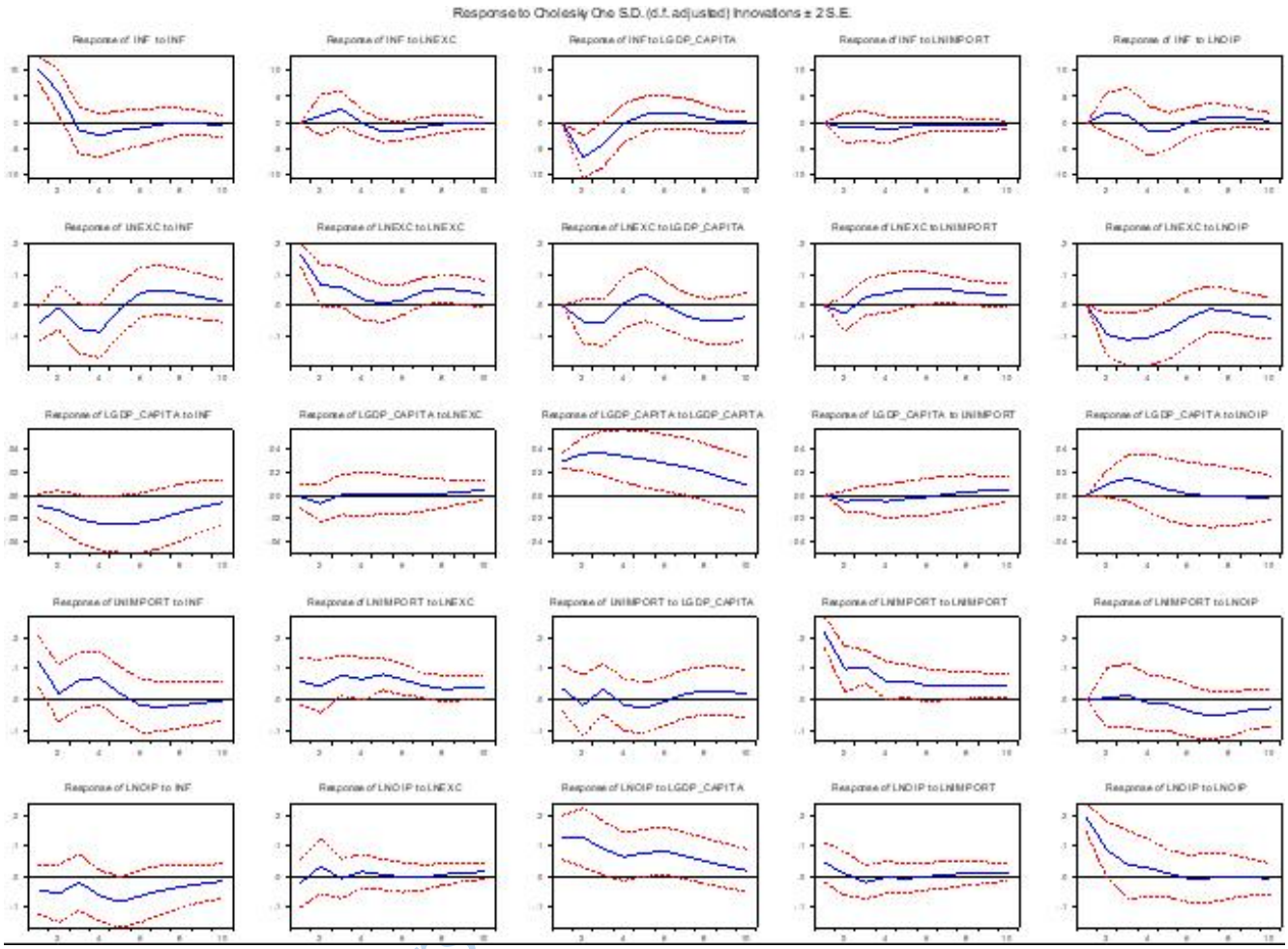


Vector Autoregression Estimates
Date: 05/10/24 Time: 19:17
Sample (adjusted): 1988 2022
Included observations: 35 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	INF	LNEXC	LGDP_CAPITA	LNIMPORT	LNOIP
INF(-1)	0.516525	-0.000185	0.000209	-0.003904	0.000979
	(0.15064)	(0.00253)	(0.00045)	(0.00378)	(0.00351)
	[3.42884]	[-0.07318]	[0.46514]	[-1.03319]	[0.27847]
INF(-2)	-0.341569	-0.010855	-0.000814	0.006905	0.001256
	(0.14874)	(0.00250)	(0.00044)	(0.00373)	(0.00347)
	[-2.29643]	[-4.34566]	[-1.83921]	[1.85090]	[0.36208]
LNEXC(-1)	10.77616	0.343474	-0.016450	0.099265	0.299431
	(9.41762)	(0.15816)	(0.02803)	(0.23620)	(0.21971)
	[1.14425]	[2.17172]	[-0.58688]	[0.42025]	[1.36283]
LNEXC(-2)	2.495220	0.247252	0.038886	0.264270	-0.159319
	(7.95610)	(0.13361)	(0.02368)	(0.19955)	(0.18562)
	[0.31362]	[1.85050]	[1.64218]	[1.32436]	[-0.85833]
LGDP_CAPITA(-1)	-260.9939	0.402539	1.031808	-1.289153	2.472576
	(72.1280)	(1.21130)	(0.21467)	(1.80903)	(1.68274)
	[-3.61848]	[0.33232]	[4.80637]	[-0.71262]	[1.46937]
LGDP_CAPITA(-2)	194.8012	0.885690	-0.247175	1.064719	-1.229072
	(54.6737)	(0.91818)	(0.16273)	(1.37127)	(1.27554)
	[3.56298]	[0.96461]	[-1.51897]	[0.77645]	[-0.96357]
LNIMPORT(-1)	-6.683239	-0.019389	-0.035702	0.453720	-0.054417
	(6.40973)	(0.10764)	(0.01908)	(0.16076)	(0.14954)
	[-1.04267]	[-0.18012]	[-1.87143]	[2.82232]	[-0.36390]

LNIMPORT(-2)	-6.863198	0.253536	0.025355	0.203538	0.020378
	(6.59594)	(0.11077)	(0.01963)	(0.16543)	(0.15388)
	[-1.04052]	[2.28884]	[1.29154]	[1.23034]	[0.13243]
LNOIP(-1)	9.953655	-0.494029	0.049905	0.026588	0.455307
	(10.0381)	(0.16858)	(0.02988)	(0.25176)	(0.23419)
	[0.99159]	[-2.93058]	[1.67038]	[0.10561]	[1.94420]
LNOIP(-2)	16.82728	-0.201660	-0.007695	0.199711	0.013606
	(11.9806)	(0.20120)	(0.03566)	(0.30048)	(0.27951)
	[1.40454]	[-1.00229]	[-0.21580]	[0.66463]	[0.04868]
C	556.5494	-8.303140	1.557631	4.455885	-7.574867
	(286.895)	(4.81806)	(0.85389)	(7.19559)	(6.69326)
	[1.93990]	[-1.72334]	[1.82416]	[0.61925]	[-1.13172]
R-squared	0.760069	0.987005	0.988227	0.988298	0.924324
Adj. R-squared	0.660098	0.981591	0.983322	0.983423	0.892792
Sum sq. resids	2535.051	0.714965	0.022456	1.594675	1.379797
S.E. equation	10.27751	0.172598	0.030589	0.257769	0.239774
F-statistic	7.602896	182.2914	201.4623	202.6998	29.31399
Log likelihood	-124.6087	18.42737	78.98883	4.389020	6.921851
Akaike AIC	7.749070	-0.424421	-3.885076	0.377770	0.233037
Schwarz SC	8.237893	0.064403	-3.396252	0.866594	0.721861
Mean dependent	19.94355	4.373143	7.580246	14.46041	3.776297
S.D. dependent	17.62833	1.272098	0.236861	2.002044	0.732298

Determinant resid covariance (dof adj.)	4.06E-06
Determinant resid covariance	6.16E-07
Log likelihood	1.937502
Akaike information criterion	3.032143
Schwarz criterion	5.476261
Number of coefficients	55

Variance Decomposition of INF:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	10.27751	100.0000	0.000000	0.000000	0.000000	0.000000
2	13.75921	73.64764	1.076332	22.83370	0.518781	1.923555
3	14.79136	64.64085	4.314539	27.65771	0.654128	2.732773
4	15.12774	64.38371	4.127328	26.44626	1.461597	3.581103
5	15.47620	62.32854	5.081144	26.37213	1.640998	4.577192
6	15.70659	60.90799	5.815526	27.19250	1.639859	4.444130
7	15.86476	59.73736	5.925899	27.88430	1.636929	4.815509
8	15.93758	59.20049	5.897242	27.92221	1.692061	5.287999
9	15.96627	58.99886	5.876624	27.83165	1.769028	5.523841
10	15.98797	58.99036	5.860826	27.76084	1.841223	5.546750

Variance Decomposition of LNEXC:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.172598	11.39903	88.60097	0.000000	0.000000	0.000000
2	0.215419	7.420024	65.84018	5.885146	1.523303	19.33134
3	0.268302	12.68147	47.41581	8.269977	2.080050	29.55270
4	0.303392	17.77619	37.54912	6.556042	3.221353	34.89729
5	0.320921	15.98667	33.59182	7.242215	5.674541	37.50475
6	0.331123	16.64912	31.85237	6.809772	8.093105	36.59564
7	0.343873	17.54722	31.30625	7.259094	9.830726	34.05670
8	0.357013	17.54192	31.32545	8.757574	10.51975	31.85530
9	0.367817	17.03745	31.14955	10.08755	10.88441	30.84103
10	0.375340	16.51253	30.79671	10.65053	11.25999	30.78024

Variance Decomposition of LGDP_CAPITA:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.030589	8.918443	0.113701	90.96786	0.000000	0.000000
2	0.050108	9.917635	1.902502	83.35447	1.179602	3.645794
3	0.066469	15.06476	1.087242	76.07415	0.925336	6.848513
4	0.079065	20.03107	0.778550	71.50876	1.092567	6.589053
5	0.088506	23.78792	0.632915	69.00137	1.010674	5.567116
6	0.095633	26.46965	0.542424	67.31619	0.889560	4.782177
7	0.100633	27.74771	0.492330	66.62455	0.812811	4.322603
8	0.103577	28.12199	0.482418	66.46332	0.834904	4.097368
9	0.105102	28.16282	0.551163	66.32104	0.960682	4.004296
10	0.105903	28.10681	0.720349	66.02147	1.156784	3.994584

Variance Decomposition of LNIMPORT:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.257769	22.98732	5.032175	1.877573	70.10293	0.000000
2	0.280931	19.90188	6.594939	1.999401	71.47086	0.032923
3	0.319347	19.37080	11.31319	2.685519	66.41998	0.210511
4	0.339485	21.43321	13.75301	2.631375	61.87884	0.303559
5	0.356300	19.77772	17.71591	3.021117	59.02804	0.457217
6	0.367722	18.86649	19.77778	2.865245	57.00047	1.490020
7	0.378224	18.22231	20.16652	2.988670	55.35703	3.265464
8	0.386873	17.63170	20.10626	3.392073	54.33523	4.534728
9	0.394015	17.07357	20.26759	3.752195	53.81779	5.088860
10	0.399988	16.57688	20.68218	3.867508	53.47406	5.399380

Variance Decomposition of LNOIP:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.239774	3.172673	0.745111	28.57274	3.576844	63.93263
2	0.293253	5.786976	1.805138	38.32358	2.483373	51.60093
3	0.310856	5.544639	1.657090	42.70988	2.572482	47.51590
4	0.325330	8.800317	1.742635	42.95887	2.357333	44.14084
5	0.345004	13.73170	1.584067	43.22719	2.134357	39.32268
6	0.360695	15.70668	1.451931	44.87976	1.952966	36.00866
7	0.369861	16.43037	1.385146	46.03588	1.883005	34.26560
8	0.375107	16.77899	1.381124	46.59928	1.926746	33.31386
9	0.377839	16.90662	1.472445	46.77047	2.013542	32.83693
10	0.379371	16.93696	1.628209	46.68565	2.138609	32.61057

Cholesky Ordering: INF LNEXC LGDP_CAPITA LNIMPORT LNOIP

Variance Decomposition of INF:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	10.27751	100.0000	0.000000	0.000000	0.000000	0.000000
2	13.75921	73.64764	1.076332	22.83370	0.518781	1.923555
3	14.79136	64.64085	4.314539	27.65771	0.654128	2.732773
4	15.12774	64.38371	4.127328	26.44626	1.461597	3.581103
5	15.47620	62.32854	5.081144	26.37213	1.640998	4.577192
6	15.70659	60.90799	5.815526	27.19250	1.639859	4.444130
7	15.86476	59.73736	5.925899	27.88430	1.636929	4.815509
8	15.93758	59.20049	5.897242	27.92221	1.692061	5.287999
9	15.96627	58.99886	5.876624	27.83165	1.769028	5.523841
10	15.98797	58.99036	5.860826	27.76084	1.841223	5.546750

Variance Decomposition of LNEXC:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.172598	11.39903	88.60097	0.000000	0.000000	0.000000
2	0.215419	7.420024	65.84018	5.885146	1.523303	19.33134
3	0.268302	12.68147	47.41581	8.269977	2.080050	29.55270
4	0.303392	17.77619	37.54912	6.556042	3.221353	34.89729
5	0.320921	15.98667	33.59182	7.242215	5.674541	37.50475
6	0.331123	16.64912	31.85237	6.809772	8.093105	36.59564
7	0.343873	17.54722	31.30625	7.259094	9.830726	34.05670
8	0.357013	17.54192	31.32545	8.757574	10.51975	31.85530
9	0.367817	17.03745	31.14955	10.08755	10.88441	30.84103
10	0.375340	16.51253	30.79671	10.65053	11.25999	30.78024

Variance Decomposition of LGDP_CAPITA:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.030589	8.918443	0.113701	90.96786	0.000000	0.000000
2	0.050108	9.917635	1.902502	83.35447	1.179602	3.645794
3	0.066469	15.06476	1.087242	76.07415	0.925336	6.848513
4	0.079065	20.03107	0.778550	71.50876	1.092567	6.589053
5	0.088506	23.78792	0.632915	69.00137	1.010674	5.567116
6	0.095633	26.46965	0.542424	67.31619	0.889560	4.782177
7	0.100633	27.74771	0.492330	66.62455	0.812811	4.322603
8	0.103577	28.12199	0.482418	66.46332	0.834904	4.097368
9	0.105102	28.16282	0.551163	66.32104	0.960682	4.004296
10	0.105903	28.10681	0.720349	66.02147	1.156784	3.994584

Variance Decomposition of LNIMPORT:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.257769	22.98732	5.032175	1.877573	70.10293	0.000000
2	0.280931	19.90188	6.594939	1.999401	71.47086	0.032923
3	0.319347	19.37080	11.31319	2.685519	66.41998	0.210511
4	0.339485	21.43321	13.75301	2.631375	61.87884	0.303559
5	0.356300	19.77772	17.71591	3.021117	59.02804	0.457217
6	0.367722	18.86649	19.77778	2.865245	57.00047	1.490020
7	0.378224	18.22231	20.16652	2.988670	55.35703	3.265464
8	0.386873	17.63170	20.10626	3.392073	54.33523	4.534728
9	0.394015	17.07357	20.26759	3.752195	53.81779	5.088860
10	0.399988	16.57688	20.68218	3.867508	53.47406	5.399380

Variance Decomposition of LNOIP:

Period	S.E.	INF	LNEXC	LGDP_CAP...	LNIMPORT	LNOIP
1	0.239774	3.172673	0.745111	28.57274	3.576844	63.93263
2	0.293253	5.786976	1.805138	38.32358	2.483373	51.60093
3	0.310856	5.544639	1.657090	42.70988	2.572482	47.51590
4	0.325330	8.800317	1.742635	42.95887	2.357333	44.14084
5	0.345004	13.73170	1.584067	43.22719	2.134357	39.32268
6	0.360695	15.70668	1.451931	44.87976	1.952966	36.00866
7	0.369861	16.43037	1.385146	46.03588	1.883005	34.26560
8	0.375107	16.77899	1.381124	46.59928	1.926746	33.31386
9	0.377839	16.90662	1.472445	46.77047	2.013542	32.83693
10	0.379371	16.93696	1.628209	46.68565	2.138609	32.61057

Cholesky Ordering: INF LNEXC LGDP_CAPITA LNIMPORT LNOIP

INF	LNEXC	LGDP_CAPITA	LNMS	INT	LNIMPORT
Mean	19.32518	4.193356	7.564171	7.508745	7.057615	14.17842
Median	12.87658	4.834956	7.575647	7.664731	7.276285	14.54799
Maximum	72.83550	5.991374	7.893406	10.60456	11.06417	16.924 33
Minimum	5.388008	0.703382	7.260400	3.169954	0.724167	8.6967 78
Std. Dev.	17.34366	1.454740	0.240130	2.428546	2.264102	2.287431
Skewness	1.777500	-0.776854	-0.002325	-0.320132	-0.984835	- 0.758499
Kurtosis	4.862995	2.443279	1.287948	1.760041	4.430893	2.54057 5
Jarque-Bera	24.83436	4.199421	4.518849	3.002299	9.137542	3.873216
Probability	0.000004	0.122492	0.104411	0.222874	0.010371	0.144 192

	INF	LNEXC	LGDP_CAPITA	LNMS	INT	LNIMPORT
INF	1	-0.4082242...	-0.4474886...	-0.4367134...	-0.0794097...	-0.4047527...
LNEXC	-0.4082242...	1	0.81653901...	0.95642700...	0.58535853...	0.96605719...
LGDP_CAPITA	-0.4474886...	0.81653901...	1	0.91779245...	0.33147590...	0.84944133...
LNMS	-0.4367134...	0.95642700...	0.91779245...	1	0.51975119...	0.97981726...
INT	-0.0794097...	0.58535853...	0.33147590...	0.51975119...	1	0.60684081...
LNIMPORT	-0.4047527...	0.96605719...	0.84944133...	0.97981726...	0.60684081...	1

Null Hypothesis: LNIMPORT has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.563809	0.0119
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

Null Hypothesis: LGDP_CAPITA has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.748059	0.8212
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.920607	0.0048
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

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

Null Hypothesis: LGDP_CAPITA has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.917737	0.7710
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

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

Residual variance (no correction)	0.001244
HAC corrected variance (Bartlett kernel)	0.002870

Phillips-Perron Test Equation
Dependent Variable: D(LGDP_CAPITA)
Method: Least Squares
Date: 05/12/24 Time: 08:24
Sample (adjusted): 1987 2022
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGDP_CAPITA(-1)	-0.020691	0.025548	-0.809911	0.4236
C	0.171355	0.193175	0.887046	0.3813

R-squared	0.018928	Mean dependent var	0.014977
Adjusted R-squared	-0.009927	S.D. dependent var	0.036121
S.E. of regression	0.036300	Akaike info criterion	-3.740042
Sum squared resid	0.044802	Schwarz criterion	-3.652069
Log likelihood	69.32075	Hannan-Quinn criter.	-3.709337
F-statistic	0.655956	Durbin-Watson stat	1.235468
Prob(F-statistic)	0.423624		

Null Hypothesis: D(LGDP_CAPITA) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.835656	0.0060
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

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

Null Hypothesis: D(LNIMPORT) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.660895	0.0000
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

NEWEWST

ARDL Error Correction Regression
Dependent Variable: D(INF01)
Selected Model: ARDL(2, 3, 2, 3, 2, 3, 3)
Case 2: Restricted Constant and No Trend
Date: 05/12/24 Time: 10:27
Sample: 1986 2022
Included observations: 33

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF01(-1))	0.265444	0.046726	5.680880	0.0005
D(LNEXC_POS)	14.13359	2.430546	5.814984	0.0004
D(LNEXC_POS(-1))	-48.78542	3.620508	-13.47474	0.0000
D(LNEXC_POS(-2))	-18.85129	2.795583	-6.743239	0.0001
D(LNEXC_NEG)	-341.9012	46.87753	-7.293497	0.0001
D(LNEXC_NEG(-1))	-152.6455	61.91289	-2.465487	0.0390
D(LGDP_CAPITA)	19.24196	22.47175	0.856273	0.4168
D(LGDP_CAPITA(-1))	-384.2384	25.69975	-14.95106	0.0000
D(LGDP_CAPITA(-2))	-275.3566	33.28174	-8.273505	0.0000
D(LNIMPORT)	20.70656	1.993529	10.38688	0.0000
D(LNIMPORT(-1))	-8.601578	1.881879	-4.570738	0.0018
D(LNMS)	-91.54173	9.409809	-9.728331	0.0000
D(LNMS(-1))	28.15978	6.654860	4.231461	0.0029
D(LNMS(-2))	44.63547	7.558149	5.905608	0.0004
D(INT)	-0.478260	0.354017	-1.350951	0.2137
D(INT(-1))	-2.809728	0.354798	-7.919243	0.0000
D(INT(-2))	-4.057857	0.367215	-11.05036	0.0000
CointEq(-1)*	- 0.649842	0.058649	-11.08017	0.0000

R-squared	0.980922	Mean dependent var	-1.071735
Adjusted R-squared	0.959299	S.D. dependent var	13.73941
S.E. of regression	2.771840	Akaike info criterion	5.179352
Sum squared resid	115.2465	Schwarz criterion	5.995629
Log likelihood	-67.45930	Hannan-Quinn criter.	5.454004
Durbin-Watson stat	1.571075		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	17.44345	10%	1.99	2.94
k 6		5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Levels Equation

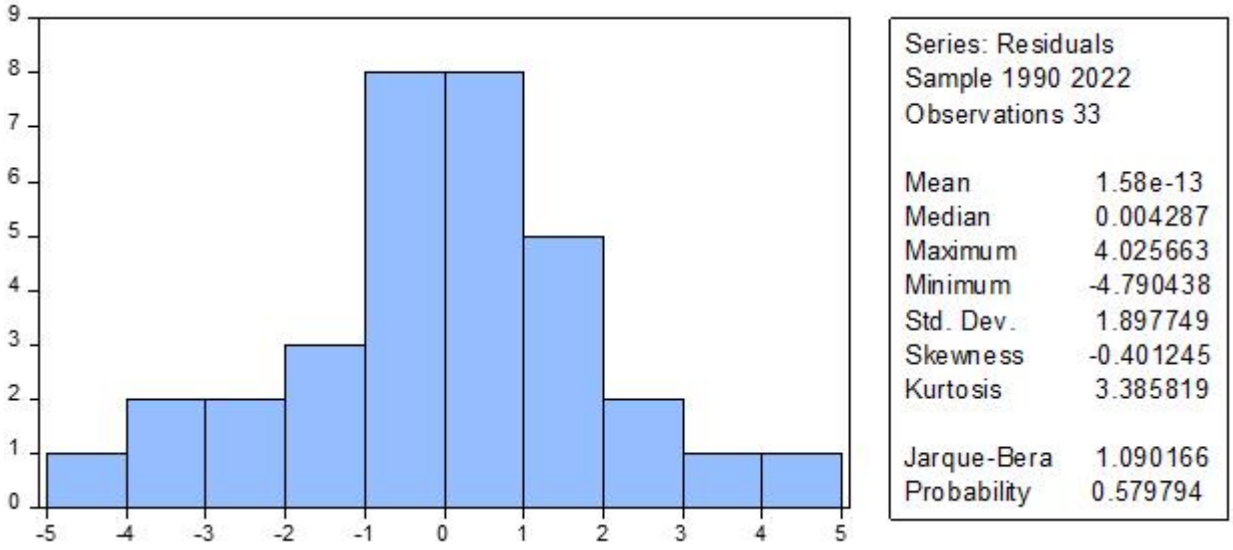
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXC_POS	63.93847	14.49401	4.411371	0.0023
LNEXC_NEG	-514.6704	110.2018	-4.670253	0.0016
LGDP_CAPITA	126.7051	46.31968	2.735450	0.0256
LNIMPORT	22.58835	8.350845	2.704918	0.0269
LNMS	-87.05603	19.09405	-4.559328	0.0019
INT	5.087759	2.598490	1.957968	0.0859
C	-887.8733	361.7791	-2.454186	0.0397

EC = INF01 - (63.9385*LNEXC_POS -514.6704*LNEXC_NEG + 126.7051
*LGDP_CAPITA + 22.5883*LNIMPORT -87.0560*LNMS + 5.0878*INT
-887.8733)

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	17.44345	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

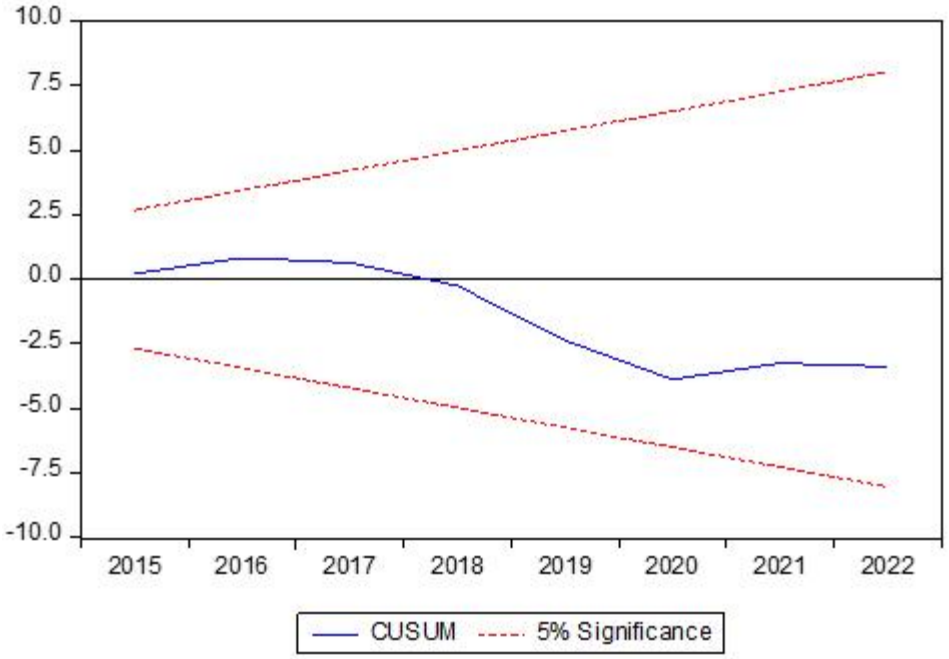


Breusch-Godfrey Serial Correlation LM Test:

F-statistic 1.280759 Prob. F(2,6) 0.3442
Obs*R-squared 9.873261 Prob. Chi-Square(2) 0.0072

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic 0.584430 Prob. F(24,8) 0.8529
Obs*R-squared 21.01434 Prob. Chi-Square(24) 0.6379
Scaled explained SS 1.473247 Prob. Chi-Square(24) 1.0000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2015
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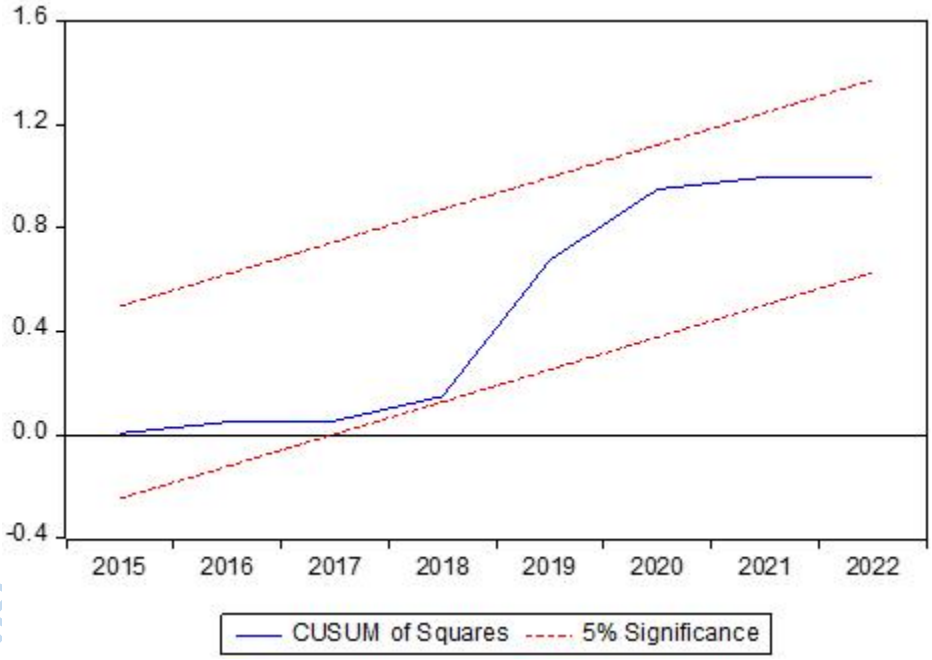
CUSUM
5% Significance


1.6
1.2
0.8
0.4
0.0
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2015
2016
2017
2018
2019
2020
2021
2022
CUSUM of Squares
5% Significance

Newest

Levels Equation

ARDL

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXC	9.142058	5.743094	1.591835	0.1310
LGDP_CAPITA	58.15364	34.76899	1.672572	0.1138
LNIMPORT	13.59944	8.745781	1.554972	0.1395
LNMS	-25.76354	12.10651	-2.128073	0.0492
INT	-0.044578	0.918275	-0.048545	0.9619
C	-457.0296	291.2590	-1.569152	0.1362

EC = INF01 - (9.1421*LNEXC + 58.1536*LGDP_CAPITA +
13.5994
*LNIMPORT -25.7635*LNMS -0.0446*INT -457.0296)

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	9.024798	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

ARDL Error Correction Regression
Dependent Variable: D(INF01)
Selected Model: ARDL(2, 2, 3, 2, 3, 0)
Case 2: Restricted Constant and No Trend
Date: 05/12/24 Time: 10:35
Sample: 1986 2022
Included observations: 34

ECM Regression
Case 2: Restricted Constant and No Trend

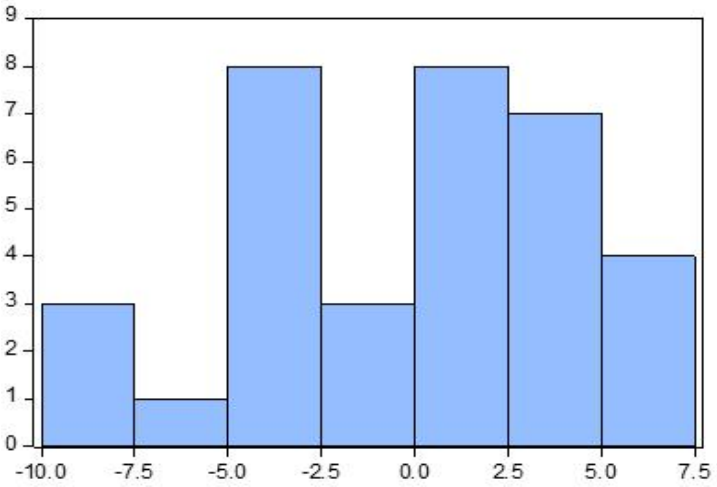
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF01(-1))	0.616675	0.084228	7.321457	0.0000
D(LNEXC)	-12.02969	3.709850	-3.242636	0.0051
D(LNEXC(-1))	-12.86311	3.915520	-3.285160	0.0047
D(LGDP_CAPITA)	8.949600	35.01517	0.255592	0.8015
D(LGDP_CAPITA(-1))	-275.8007	39.54248	-6.974795	0.0000
D(LGDP_CAPITA(-2))	-114.3897	40.36366	-2.833976	0.0120
D(LNIMPORT)	23.05163	3.719704	6.197168	0.0000
D(LNIMPORT(-1))	-6.073333	3.615092	-1.679994	0.1124
D(LNMS)	-30.40197	11.76445	-2.584223	0.0200
D(LNMS(-1))	26.82400	9.413907	2.849401	0.0116
D(LNMS(-2))	18.98386	10.51122	1.806056	0.0898
CointEq(-1)*	-1.088038	0.116741	-9.320069	0.0000

R-squared	0.897189	Mean dependent var	-1.159170
Adjusted R-squared	0.845783	S.D. dependent var	13.53923
S.E. of regression	5.316924	Akaike info criterion	6.450231
Sum squared resid	621.9330	Schwarz criterion	6.988947
Log likelihood	-97.65393	Hannan-Quinn criter.	6.633949
Durbin-Watson stat	1.591942		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.024798	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15



Series: Residuals	
Sample 1989 2022	
Observations 34	
Mean	6.87e-14
Median	0.385714
Maximum	7.254788
Minimum	-9.047705
Std. Dev.	4.341250
Skewness	-0.204799
Kurtosis	2.226588
Jarque-Bera	1.085078
Probability	0.581271

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.877256	Prob. F(2,14)	0.4376
Obs*R-squared	3.786432	Prob. Chi-Square(2)	0.1506

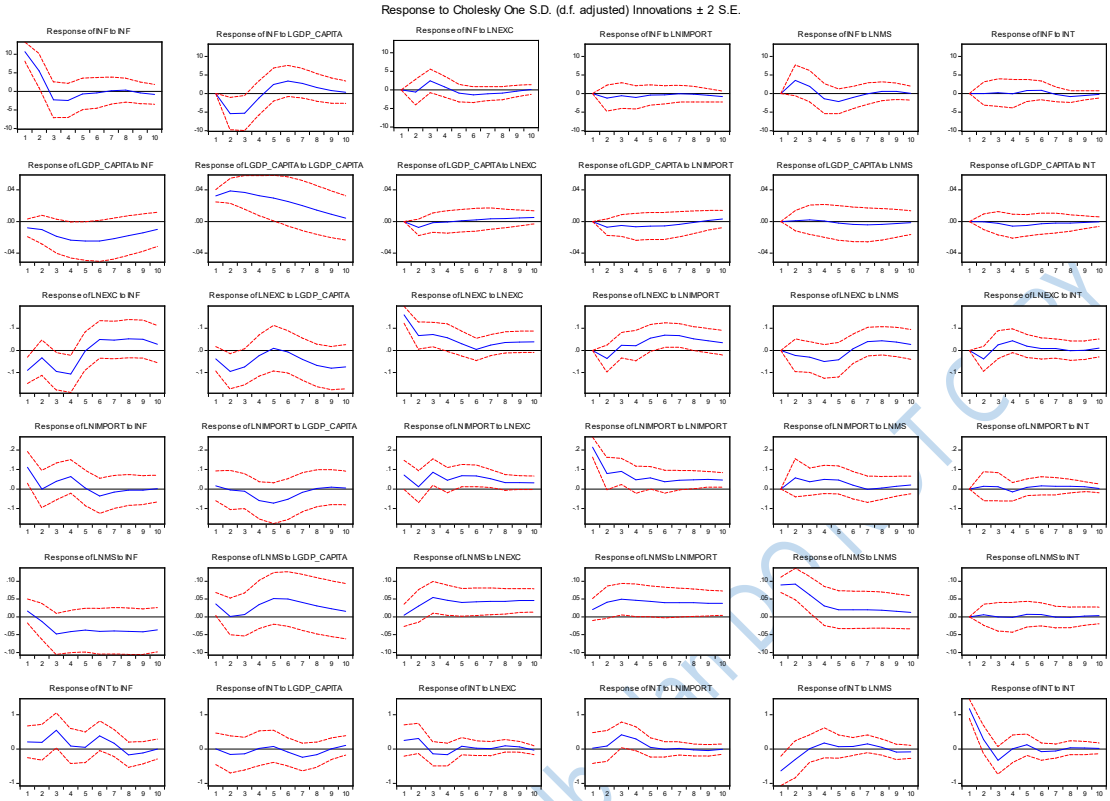
Heteroskedasticity Test: Breusch-Pagan-Godfrey

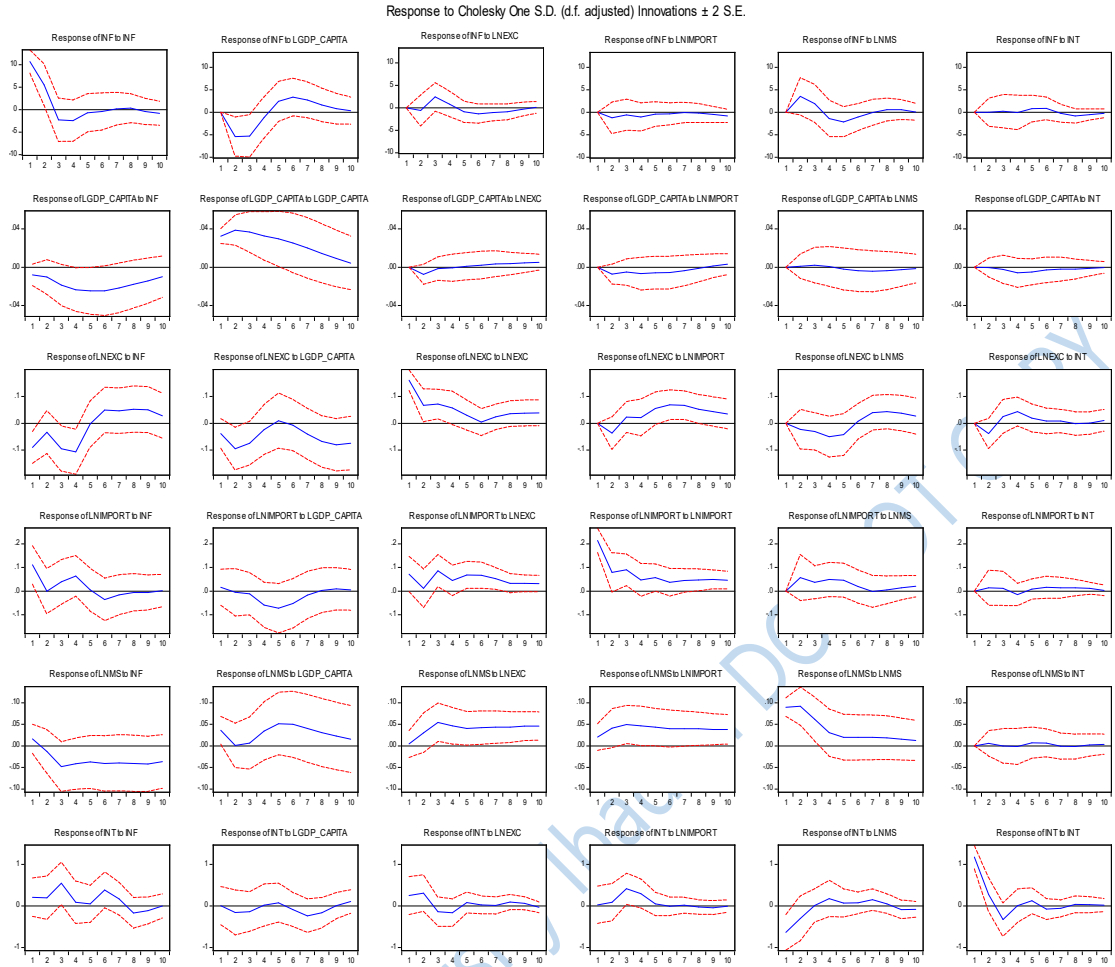
F-statistic	0.565362	Prob. F(17,16)	0.8731
Obs*R-squared	12.75925	Prob. Chi-Square(17)	0.7521
Scaled explained SS	1.732910	Prob. Chi-Square(17)	1.0000

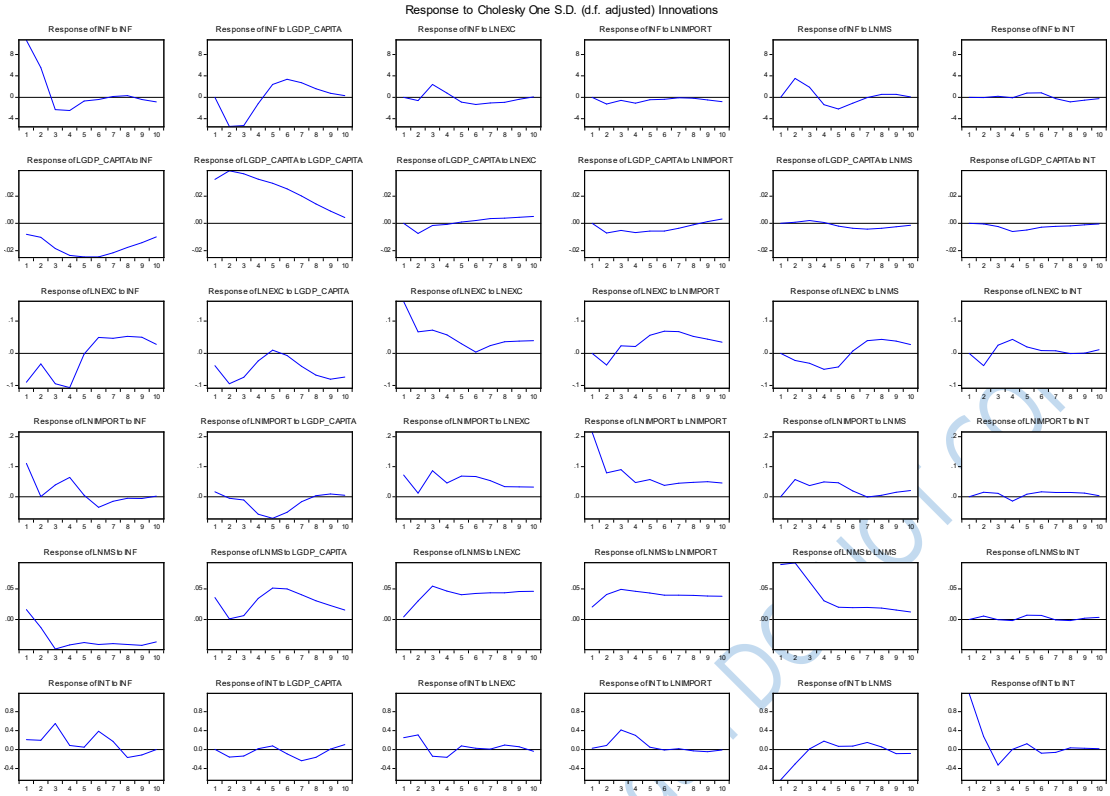
Vector Autoregression Estimates
Date: 05/19/24 Time: 22:20
Sample (adjusted): 1988 2022
Included observations: 35 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	INF	LGDP_CAPITA	LNEXC	LNIMPORT	LNMS	INT
INF(-1)	0.398292	1.54E-05	0.002736	-0.006218	-0.003682	0.020930
	(0.17357)	(0.00054)	(0.00306)	(0.00411)	(0.00163)	(0.02245)
	[2.29468]	[0.02828]	[0.89396]	[-1.51166]	[-2.25614]	[0.93209]
INF(-2)	-0.259629	-0.000682	-0.012870	0.008318	9.73E-05	0.002675
	(0.17068)	(0.00053)	(0.00301)	(0.00405)	(0.00160)	(0.02208)
	[-1.52111]	[-1.27684]	[-4.27630]	[2.05632]	[0.06063]	[0.12114]
LGDP_CAPITA(-1)	-206.3712	1.167267	-1.693351	-1.233170	-1.060017	-1.646781
	(59.6562)	(0.18671)	(1.05188)	(1.41378)	(0.56093)	(7.71757)
	[-3.45934]	[6.25188]	[-1.60983]	[-0.87225]	[-1.88975]	[-0.21338]
LGDP_CAPITA(-2)	185.0129	-0.306855	1.021271	0.489884	1.559976	3.014820
	(59.7053)	(0.18686)	(1.05275)	(1.41495)	(0.56139)	(7.72392)
	[3.09877]	[-1.64216]	[0.97010]	[0.34622]	[2.77878]	[0.39032]
LNEXC(-1)	-0.550546	-0.030046	0.533070	-0.099079	0.112228	1.371080
	(8.55138)	(0.02676)	(0.15078)	(0.20266)	(0.08041)	(1.10627)
	[-0.06438]	[-1.12264]	[3.53538]	[-0.48890]	[1.39577]	[1.23937]
LNEXC(-2)	5.263828	0.051357	0.115674	0.285645	0.037164	-2.192089
	(7.87948)	(0.02466)	(0.13893)	(0.18673)	(0.07409)	(1.01935)
	[0.66804]	[2.08255]	[0.83258]	[1.52969]	[0.50162]	[-2.15048]
LNIMPORT(-1)	-9.588842	-0.033998	-0.120678	0.300476	0.088330	0.531652
	(7.73184)	(0.02420)	(0.13633)	(0.18324)	(0.07270)	(1.00025)
	[-1.24018]	[-1.40498]	[-0.88519]	[1.63984]	[1.21499]	[0.53152]
LNIMPORT(-2)	-8.680596	0.021476	0.251561	0.098149	-0.016139	2.306106
	(7.45121)	(0.02332)	(0.13138)	(0.17658)	(0.07006)	(0.96394)
	[-1.16499]	[0.92093]	[1.91471]	[0.55582]	[-0.23035]	[2.39237]
LNMS(-1)	39.00574	0.008128	-0.479145	0.726900	1.061551	-1.673918
	(23.4273)	(0.07332)	(0.41308)	(0.55520)	(0.22028)	(3.03073)
	[1.66497]	[0.11086]	[-1.15993]	[1.30926]	[4.81912]	[-0.55232]
LNMS(-2)	-26.18087	6.64E-05	0.509820	-0.278639	-0.292470	-0.160054
	(19.6004)	(0.06134)	(0.34560)	(0.46451)	(0.18430)	(2.53565)
	[-1.33573]	[0.00108]	[1.47516]	[-0.59986]	[-1.58696]	[-0.06312]
INT(-1)	-0.027438	-0.000319	-0.032376	0.012499	0.004784	0.237334
	(1.32392)	(0.00414)	(0.02334)	(0.03138)	(0.01245)	(0.17127)
	[-0.02072]	[-0.07701]	[-1.38690]	[0.39837]	[0.38428]	[1.38572]
INT(-2)	0.042280	-0.002147	0.049683	-0.004164	-0.004419	-0.288319
	(1.24806)	(0.00391)	(0.02201)	(0.02958)	(0.01174)	(0.16146)
	[0.03388]	[-0.54963]	[2.25767]	[-0.14078]	[-0.37655]	[-1.78571]
C	318.3840	1.134975	4.890011	10.14133	-3.465270	-26.00327
	(260.228)	(0.81444)	(4.58844)	(6.16709)	(2.44684)	(33.6650)
	[1.22348]	[1.39357]	[1.06572]	[1.64443]	[-1.41623]	[-0.77241]
R-squared	0.763351	0.987161	0.985871	0.989695	0.998728	0.588605
Adj. R-squared	0.634270	0.980157	0.978164	0.984075	0.998035	0.364208
Sum sq. resids	2500.380	0.024491	0.777374	1.404298	0.221059	41.84616
S.E. equation	10.66085	0.033365	0.187977	0.252649	0.100240	1.379166
F-statistic	5.913723	140.9557	127.9240	176.0799	1439.940	2.623049
Log likelihood	-124.3677	77.47081	16.96283	6.613830	38.96892	-52.78926
Akaike AIC	7.849584	-3.684046	-0.226448	0.364924	-1.483938	3.759386
Schwarz SC	8.427285	-3.106346	0.351253	0.942625	-0.906237	4.337087
Mean dependent	19.94355	7.580246	4.373143	14.46041	7.752479	7.415241
S.D. dependent	17.62833	0.236861	1.272098	2.002044	2.261220	1.729652

Determinant resid covariance (dof adj.)	1.58E-06
Determinant resid covariance	9.73E-08
Log likelihood	-15.42849
Akaike information criterion	5.338771
Schwarz criterion	8.204975







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Baptist Primary School, Komu	1978 – 1984
Komu/Babaode High School, Komu	1985 – 1991
Local Authority Teachers' College Iseyin	1991 – 1994
Kwara State Polytechnic, Ilorin	1998 - 1999
University of Ado Ekiti, Nigeria	2005 – 2011

Academic Qualification(s) Obtained with Dates

Primary School Leaving Certificate	1984
West African Senior School Certificate	1991
Teachers' Grade Two	1994
National Diploma in Statistics	1999
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Baptist Primary School, Komu	1994 – 1997
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The University Compliance Certification

This is to certify that this thesis by **Sunday Aderibigbe ADELERE** with Matric. Number **LCU/PG/001647** in the Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan is in full compliance with the approved University format and style.

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Signature **Date**