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ATTESTATION

I hereby attest that this research work was carried out at the Department of Economics,

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DEDICATION

This thesis is dedicated to Almighty God, the Creator of Heaven and Earth for His sure protection over me and my entire household.

It is also dedicated to the sweet memories of my parents, Pa Paul Ojo and Mama Florence Aina Ojo, as well as my late wife, Mrs. Mary Modupe Olayinka and my living wife, Mrs. Sarah Omolara Onaara, for their immense contributions to my moral development and academic achievement.

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Abstract

In West African countries, the economic instability caused by inflationary pressure has prompted some concerns about the primary reasons driving inflation rates. This study examined the relationship between exchange rate fluctuations and inflation rates in 15 West African countries in the short run and long run covering a 31-year period from 1990 to 2020, with emphasis on differential effects in Anglophone and Francophone West African countries. The scope of the study is divided in geographical, contents and units of analysis. The Purchasing Power Parity (PPP) framework formed the basis for this study. The study adopted the monetarist and classical model of determinants of inflation which was remodified by incorporating inflation rate (INF), exchange rate (EXR), exchange rate volatility (EXRv), monetary policy variables, and fiscal policy variables. Panel data for all the variables were obtained from World Bank Development Indicators for the period under review. Linear Autoregressive Distributed Lag (ARDL) and non-linear Autoregressive Distributed Lag (NARDL) estimation techniques were used for result reliability. Volatility was generated through ARCH model while CUSUM test was carried out to check for the stability of the series. The ARDL model results showed that the previous inflation rate contributed about 7% to the recent price instability in the region. It was further revealed that exchange rate fluctuations positively influenced inflation rates by about 4% in Anglophone countries in the short run with greater influence in the Francophone countries. Meanwhile, the results from non-linear Autoregressive Distributed Lag (NARDL) model revealed that exchange rate depreciation contributed not less than 2% to inflation rate in the long run and was statistically significant. The findings from Anglophone countries demonstrated that the policy of the monetary authorities to increase the quantity of money in circulation, if well managed, will not result in high rate of inflation in West African countries. Findings from Francophone countries showed that money supply, economic growth rate, and public debt did not contribute to the inflationary trends in the region. However, producer price index, the degree of trade openness, exchange rate and value added triggered inflation rates in the Francophone countries within the period under review. According to the findings, exchange rate fluctuations contributed to inflationary pressures in the West African region. The study recommended that floating exchange rate regime should be maintained and supported with high productivity of farm produce for exports without damaging the consumption level of the domestic economy; and that monetary authorities in this region should employ contractionary monetary policy so as to reduce the stock of money in circulation. Monetary authorities in the region should also maintain single-digit inflation rate for price stability to be maintained. Single currency should also be adopted among the member states so as to stabilize cross-border transactions, and finally, concessions in form of subsidies should be given to domestic industries so as to enhance productivity which will reduce the prices of goods and services and thereby reduce inflation to the barest minimum.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Since the First World War in 1914, attention had been shifted to the factors and management of exchange rate in developed, emerging and developing economies (Naghdi & Kaghazian, 2015; Senadza & Diaba, 2018). Primarily, the idea of exchange rate could be traced to the scientific study of money and its various forms. Unlike barter system, money serves as a unit of account, and created for face-lifting trades among people in the society. The trading partners considered silver and gold as forms of money to conduct their businesses and facilitate easy exchange of goods and services. Shortly after the extinction of barter system and quasi money where animals, wine, oil, cowry shells, beads and precious metals were considered valuable to average person, the benefits of paper money became evident in the trading process.

Moreover, the industrial revolution in the early eighteen centuries, and the independence of European nations in the nineteenth century led to the need for a more formalized system of payment and international settlement. Since no country is self-sufficient, they all conducted businesses with one another thereby making convertible currencies become accessible. More so, exchange rate enables trading partners to evaluate prices of commodities and services and financial assets to be extracted in diverse currencies (Owolabi & Adegbite, 2017). Given that purchasing power between two countries is the fee in which the term currency will be exchanged for base currency. Hence, the idea of exchange rate can be viewed as set of policies available for a particular country to perform monetary policy role. This allows trade across border to be conducted which provides means of exchanging one currency for another. It is in accordance with the rate of

exchange between them and regimes agreed upon and practiced by the country (Osho & Efuntade, 2019).

Before 1933, most of the countries were on gold standard. This period was characterized by the regimes of fixed rate system when currency issued can either be in gold or redeemable in gold. For instance, in 1944, Breton Wood system was created to stabilize the dollar, but United States fixed the US dollar to gold while the other sovereign nations align home currencies to the US dollar under the Breton Woods system. This is to ensure and maintain stability of exchange rates among the currencies in the world economy (Eiji & Makoto, 2019). However, after some successful periods of the system, the Breton Wood system collapsed in 1971 due to the inability of United States to sustain the value of US dollar against gold to discontinue the convertibility of US dollar to gold. More so, United States of America, when it experienced influx of capital from other countries, it abandoned fixed rate to gold and allow dollar to float.

Other countries' currencies that were pegged to the dollar equally floated their currencies (Nelson, 2018). Meanwhile, United States of America (USA), Japan, United Kingdom (UK), and China have economic strength to manage their currencies differently to safeguard their balance of payment and reserves through trade flows but the concept of floating remains a significant policy in these countries. The Breton Woods Monetary System's termination in fixed parities, which led to the usage of floating/flexible regimes by several countries starting in 1973 and broad, unpredictable changes in bilateral exchange rates, is where the exchange rate regimes originated (Senadza, & Diaba, 2018).

Many economists believed that the currency value against other currencies is subjected to variation from the underlying price at equilibrium due to the different trade patterns and monetary policies framework. This variation is known to be exchange rate fluctuation which is the sharp movements of rate of exchange between two currencies. The significant changes in exchange rate oscillation do not only affect developing economies but also the advanced economies. Specifically, the country in which firms rely solely on imported production inputs could record massive changes in losses and profits due to sharp movement in exchange rate. This triggers the Apex bank and monetary authorities to maintain exchange rate from oscillating too wide from the equilibrium to ensure stable business environment for firms.

The fluctuations in exchange rate could experience an upward swing in value (appreciation) or downward swing (depreciation) relative to other countries. The value of currency is said to be fluctuating when there is no stable rate in relation to the basic market rate (Nelson, 2018). More specifically, if the currency is priced higher than its original value in the market, such currency is known to be overvalued, but undervalued when low. However, in 2021, an economy with trade surplus like UK, China, US, among others gain more currency value in the international market compared to an economy with trade deficit such as Nigeria, Kenya, Ghana and other West African nations (Statista, 2021).

Consequently, the dissimilarity in exchange rate systems and the effects on inflation in different countries show how monetary authorities determined exchange rate in an economy (Ehsani, Khanalipour & Abbasi, 2009). It was noted that not less than 36% of all countries of the world, especially the strong economies like China, Saudi Arabia and Japan use floating policies to manage their exchange rate and stabilize the value against other developed countries (Gudmundsson,

2005). However, the weak countries and low-income economies such as Panama, Honk Kong, and some Sub –Sahara Africa countries are facing economic difficulties to enjoy the benefits of floating exchange rate polices such as stability in the balance of payments (BOP), unrestricted foreign exchange, enhancement of market efficiency and protection of imported inflation to mention but few, which sometimes exert economic hardship as price levels in their respective countries are inflated because of unstable exchange rate and inability to maintain stable macroeconomic policies and stabilize the currency value (IMF, 2020). For more than five decades, many African countries are faced with high percentage of inflation rate and it remains a major challenge in the recent years as 15% is the least experienced in the last two decades (Greene, 1989; IMF, 2020).

Yet, managing the rate is a topmost priority for policy makers and monetary authority in African countries. Meanwhile, the connectivity between the price level and the major determinants of exchange rate has increasingly generated considerable arguments in the literature and among economists in recent times. The foundation of the relationship could be traced to the study of Dornbush in 1987. He investigated the factor influencing instability in domestic price level and consider exchange rate as the major factor influencing local prices. The study found out that the rate of exchange positively influenced price level domestically with other variables such as import substitution, domestic production and market concentration as control factors. This allows trade across border to be conducted by providing means of converting one currency to another in accordance with the rate of exchange between them, depending on the exchange rate regimes agreed upon(fixed) or set by the market(floating), practiced by the country (Osho & Efuntade, 2019).

Currently in West African region, imports exceed exports, thereby causing current account imbalance. If consumer goods are the major imports into the country due to inability of the domestic firm to produce such goods, it poses more harm to the economy. External conditions, especially increasing commodity prices are expected because of the positive economic prospects of the developed nations. This may also boost West African growth in the short and medium term. The foreign investors now perceived new opportunities in the region, beyond traditional destinations (such as Nigeria), in an expanding market such as Côte d'Ivoire. And the China's manufacturing costs, increasing due to labour costs, thereby giving an opportunity for West Africa to compete in that sector. Can West Africa region earn more income from these opportunities? To achieve this, the region must increase their export rate. The incessant and current dependence of some West African countries on crude oil exports leave them exposed to external shocks. Today's growth estimation depends solely on stable production of oil, reasonable and favourable oil prices – an ongoing and recent risk to West African economies' growth (African Economic Outlook, 2018).

Taking cognizance of some countries' economy attributes, The Republic of Benin is blessed with 12.39 million people living in the country (Worldometer, 2021). The country has a record of decline GDP growth of 2.3% in 2020 as against 6.9% and 6.7% in 2019 and 2018 respectively. The recent decline in GDP growth rate is attributed to the effect of COVID-19 on the global economies. This pandemic affected several sectors in Benin including transport, commerce, hostel and restaurants, as well as the agricultural sector. The slow growth is also caused by low consumption and investment. Hence, Benin's inflation rate doubled rising from 0.9% to 2% in 2020 due to increased food prices. Similarly, the income from taxation fell to 6.5% and government expenditure rose to 14.3% in 2020. This is also attributed by poor economic performance and

increase in social and health expenses. Budget deficit indicates 3% of GDP in 2020 as against 0.5% of GDP in 2019. However, 2.02% unemployment rate was captured in 2020 compared to 2.23% in the previous year while poverty rate surge from 33% in 2007 to 38.5% in 2019 (African Economic Outlook, 2021).

In Burkina Faso, the population is estimated at 21.42 million with a GDP declined by 0.2% in 2020 compared to a surge of 5.7% in 2019. This GDP decline is caused by to poor performance of some sectors such as tourism, trade, transport, and hotels due to pandemic effect. As a result, inflation rose to 1.4% in 2020 against -3.2% in 2019. The increase in government expense during COVID-19 period coupled with low income accrued to government account exacerbate budget deficit estimating at 5.4% of GDP in 2020 compared to 3.5% in 2019. The gold and cotton export values show 21% and 13% respectively while petroleum imports fell by 20% due to unstable economic activity. The poverty rate shows a record of 41.4% in 2015, and the rate of unemployment increases from 6.26% in 2019 to 6.41% in 2020 (African Development Bank, 2021).

The Cape Verde is the third least populated country in Africa with a population of 561, 280 people living in the country. Economic Outlook of Cape Verde, (2021) reported that the growth rate shrunk by 8.9% in 2020 which was driven by poor performance of construction industry, tourism, trade and transport. The inflation rate declined by 0.1% between 2019 and 2020, because of the exchange rate peg against euro and reduced costs of energy in the country. Furthermore, the decline in revenues, especially tourism by 65% leads to fiscal deficit of 10.4% of GDP in 2020 as against 1.8% of GDP in 2019. The performance of banking also dropped, as a result of non-performing loans of 12%. Similarly, more than 20,000 works/employments were lost in 2020. Hence, the

employment rate surge to 19.2%and poverty shows a record of 35.5% in 2020 as against 29.3% in 2019 (Cape Verde Economic Outlook, 2021).

About 26.94 million people were estimated to be living in Cote d'Ivoire. The GDP growth rate of 1.8% in 2020 fell below the record of 6.4% growth in 2019. The Cote d'Ivoire economy was also affected by coronavirus, reducing agricultural output by 2.2%, forestry by -16.5%, Agro-food industries by -1.3%, petroleum product (-26.9%), among others. The country's Inflation increased from 0.8% in 2019 to 1.8% in 2020, and the budget deficit record of 5.5% due to higher expenditure incurred by the government on health and the entire economy during the pandemic. The current account deficit shifts from 1.9% to 3.5% between 2019 and 2020, poverty level shows a record of 46.3% and unemployment rate is estimated at 3.42% in 2020 (Cote d'Ivoire Economic Outlook, 2021).

In Ghana, about 31.65 million people reside in the country. However, the GDP dropped to 1.7% in 2020 from 6.5% in 2019.This reason is not far-fetched as pandemic (COVID-19) hits oil prices and weakened economic activity worldwide. Ghanaian inflation is estimated at double digits in 2020 from a single digit in 2019 due to expansionary monetary policy targeting at reducing the effect of coronavirus on the economy. Revenues also fall while government expenditure rises, and as a result, the fiscal deficit shifts from 4.8% in 2019 to 10.5% of GDP in 2020.

International reserves maintained an import covers of four months and Ghana currency (cedi) depreciated by 3.1% in 2020 compared to 10% in 2019. The country's debt to GDP ratio shifted to 71% in 2020 as against the previous year of 63%. Furthermore, about 770,000 individuals witnessed a decline in wages while 42, 000 people lost jobs, thereby increasing unemployment

rate to 4.51% of the labour force in 2020. Poverty rate recorded a slightly or no changes of 11.2% in 2020 as against 11.1% in 2019 (Ghana Economic Outlook, 2021).

Mali was populated by 20.78 million people with a record of 5.1% GDP growth rate before the coronavirus outbreak. However, the outbreak and a military coup d'état in August, 2020 exacerbate the economic condition, recording a decline of 3.5% in the performance of the secondary sector and 5.5% in the tertiary sector. The inflation initially put at 2.9% is expected to increase by 0.5% in 2020. This is attributed to cereal production and supply disruptions. The budget deficit shows a record of 6.1% in 2020 as against 1.8% in 2019 arising from the low tax revenue. There is an improved current account deficit from 4.2% to 1.7% in 2020. However, unemployment rate increased from 7.22% in 2019 to 7.34% in 2020, while about 42.1% people fall below poverty line (World Data Atlas, 2021).

In Niger Republic, the population is about 25.01million people. In spite of the success of the government in managing the pandemic outbreak, the economy experienced a slow growth with an estimate of 1.2% in 2020 as against 5.9% in 2019 and 7% in 2018. The investments and consumption were obstructed and the extractive as well as the service industry deteriorated. In 2020, the country also witnessed inflation of 2.8% compared to deflation period of 2.5% in 2019. The budget deficit shows a record of 5.7% of GDP while current account deficit shifts from 12.5% in 2019 to 12% in 2020 and about 0.49% unemployment rate in 2020 (O'Neill, 2021).

Nigeria is blessed with about 218 million people (Worldometer, 2021). This represents the highest populated country in Africa. In an attempt to curb the deadly virus in the country, the performance of tourism, hospitality, aviation, restaurants, trade and manufacturing sectors were seriously affected. This led to contraction in real GDP by 3% in 2020 and a surge in inflation from 11.4%

in 2019 to 12.8% in 2020. The upsurge in inflation was caused by increase in prices of food, petroleum subsidies removal, increase in electricity tariff and a significant effect of exchange rate premium rose to 24%. The apex institution of Nigeria further cut the policy rate to 11.5% to strengthen the economy, yet the country witnessed broaden fiscal deficit of 5.2% in 2020 compared to 4.3% in 2019. The total debts indicated 25% of GDP ($85.9billion), about 2.4% higher than the previous year. While foreign debt was estimated at 37%, domestic debts show 63% of the total debts. Debts servicing by the Nigerian government was extremely high representing more than half of the federally collected incomes/revenues (Nigeria Economic Outlook, 2021). Furthermore, National Bureau of Statistics (NBS) reported that about 40% of the population or nearly 83million people fall below poverty line in 2019. However, unemployment rate dropped from 8.1% in 2019 to 7.96% in 2020 (O'Neill, 2021).

In Senegal, about 17.14million people live in the country. The implication of the pandemic led to the country's recession in 2020 due to a decline in trade by 0.6%, tourism (17%), and transport by 8.8% coupled with decrease in investment and external demand. Tax revenue falls while public expenditure increases and in turn, worsened the fiscal deficit to 6% of GDP in 2020 against 3.7% in 2019. This further affected the current account deficit, estimated at 10.3% in 2020 compared to 7.9% of GDP in 2019. It was recorded that the people living below poverty line is not less than 37% of the populace while being without a job rate increases marginally from 6.6% in 2019 to 6.68% in 2020 (Senegal Economic Outlook, 2021).

As regards Togo, the residence is estimated at 8.45million people with a real GDP growth rate of 5%, 5.5% and 0.4% in 2018, 2019 and 2020 respectively. The current decline in GDP arises from the implication of global infections tagged as COVID-19. The pandemic hit portfolio and direct

investments, remittances and global trade. The monetary authority responded by formulating and implementing a prudent monetary policy, yet the inflation was doubled to 1.6% in 2020 from 0.7% in 2019. Tax revenues fell, public spending increases (especially health spending), budget deficit worsened to 4.7% from 0.8% of GDP, and current account deficit grew to 3.2% in 2020 from 2.2% in 2019. Unemployment rate dropped slightly from 2.04% in 2019 to 2.01% in 2020 and over 50% populace are earning meager amount that subjected them to be below poverty line (African Development Bank, 2021).

1.2 Statement of the Problem

Currently in West African region, imports exceed exports, thereby exacerbating the current account balance. If consumer goods are the major imports into the country due to inability of the domestic firms to produce such goods, it poses more harm to the economy. External conditions, especially increasing commodity prices are expected because of the positive economic prospects of the developed nations. The incessant and current dependence of some West African countries on crude oil exports leaves them exposed to external shocks. Today's growth estimation depends solely on stable production of oil, reasonable and favourable oil prices – an ongoing and recent risk to West African economy's growth (African Economic Outlook, 2018).

The growth rate of West African economies has not been sufficient to achieve poverty reduction as firms and farmers produce and trade in domestic markets without enjoying or achieving the needed economies of scale to attract wider and cross-border trade or investment to attain higher growth rate and minimize poverty (African Economic Outlook, 2018). This is attributed to several constraints such as poor transport system, trade barriers, over-reliance on informal sources of fund, and insufficient or poor power supply. These factors reduce the level of competition of West

African products with other developed nations in the international market. Although many West African nations witnessed high economic growth between 2012 and 2015, the growth declined in 2016 estimating to about 0.5% (African Economic Outlook, 2018).

It has been established in the previous studies that the consistent rise in inflation rate in African countries is associated with distorted economic growth, unemployment rate, high dependence on imported goods, uncontrolled capital flight, monetary expansion, budget deficit, high production cost, unchecked broad money supply, fiscal indiscipline, rising global oil and food prices; and unstable macroeconomic environment (Berg, et al. 2015; Giordani, Rocha, & Ruta 2016; Fukase & Martin 2017). In time past, it has been observed that the government's effort to use monetary policy as a supporting instrument for financing fiscal deficit has led to high inflation in the region (Berg, 2015, IMF, 2020). Some of the adverse impacts of rising inflation rate do not only lead to economic distortion but also low capital formation, high poverty rate, inequality, and poor investment returns which are capable of dampening economic development. Also, it affects the purchasing power of the individuals and serves as the worst of indirect burden to the poor people (Paul, 2022).

Despite all the efforts and various economic recovery programs across the region, West African countries are still faced with high wave of inflationary pressure. For instance, developed economies and African countries have tried within their policy ambience to find appropriate policy framework to manage inflationary issues (AFDB, 2019). Between 1980 and 1990, successive governments in the Sub-Sahara African countries resurrected various reform programs such as exchange rate unification, limitation of financing government flamboyant expenses, which recorded a success as countries enjoyed debt relief, improved external sector and reestablishment

of fiscal discipline and provided strong support for disinflation programs and brought inflation rate to single digit. Meanwhile, most of the countries that earn low income and those that fall within middle income category are yet to find and implement effective and efficient policy that can tame spiral price level pressure (IMF, 2020).

Whether all these challenges can explain the current inflationary trends in West African countries remain a question of empirical studies which is critically answered in this study. This is important because the consumption level of West African countries is fast rising than their productivity and still facing a problem of shortage in agricultural produce and raw materials. This means that importation is inevitable in the short run. This, however, leads to imported inflation from other developed countries. West Africa countries are faced with highly depreciated value of domestic currency resulting from low tradable goods to hold the conditions in Marshall-Lerner exchange rate theory. Meanwhile, the efforts of governments to solve these problems prove abortive and unsuccessful due to poor policy formulation. Therefore, rising inflation rate continues to cause more harm than good in West African countries.

This study, however, looked into the factors triggering inflation rate in West African countries considering the main role of exchange rate fluctuations.

1.3 Research Questions

The following research questions are considered relevant for this study:

i. What is the long-run relationship between exchange rate fluctuations and inflation rates in West Africa?
ii. What is the relationship between exchange rate pass–through and inflation rates in West Africa?

iii. What is the differential effect of exchange rate fluctuations on inflation rates in Anglophone and Francophone West African countries?

1.4 Objective of the Study

The aim of this research is to investigate the economic relationship between exchange rate fluctuations and inflation rates in West African Countries. However, the specific objectives are to:

i. examine the long-run relationship between exchange rate fluctuations and inflation rates in West Africa.

ii. analyze the relationship between exchange rate pass–through and inflation rates in West Africa.

iii. examine the differential effect of exchange rate fluctuations on inflation rates in Anglophone and Francophone West African countries.

1.5 Statement of Hypotheses

The following null hypotheses shall be formulated for testing in this study:

H_{01}: There is no long-run significant relationship between exchange rate fluctuations and inflation rates in West Africa.

H_{02}: There is no significant relationship between exchange rate pass–through and inflation rates in West Africa.

H_{03}: There is no significant differential effect of exchange rate fluctuations on inflation rates in Anglophone and Francophone West African countries.

1.6 Justification for the study

It has been reported that the sporadic increase in inflation rate causes more harm than good, and devastatingly push more people into poverty due to low level of purchasing power. Notably, while addressing the issue of hike inflation rate globally, the poverty rate in some developing countries continues to increase intermittently. The quest to provide appropriate policy formulation and management of inflation in developing nations has triggered many research studies. However, it is evident in the literature that there is still huge gap to be filled in the existing studies which is causing disagreement in the literature. The global inflationary pressure in many European and African countries has forced central banks, monetary authorities and Economic Union in West African region to place a considerable debate on factors influencing untamed inflation.

In order to solve the lingering issues around inflationary gap in West African region, this study not only verifies the existence of links between fluctuation of exchange rate and inflation because it has been done in the various studies, but also found out the determinable factors that indirectly affect inflation rate in the region. It has been observed in the literature that the country that is highly dependent on import is vulnerable to changes in domestic prices (Ndiaye, 2021). It is then argued in this study that the exchange rate regimes differential plays a huge role on the rising and management of exchange rate pass through to inflation in the region. Understanding more about the influence of different exchange rate regimes on inflation rate through this study could help monetary authorities of West African countries to formulate appropriate policy as well as broaden the research domain in this aspect.

There have been arguments that countless government policies are counterproductive and pose negative effect on the masses but enrich the political office holders. While these facts remain

unchanged, the empirical understanding on factors causing inflation rate and price instability continue to be a major concern and challenges in West African countries. These and many other challenges spur the interest of this current research to further analyze the effect of trade openness, taxes on goods and services, and devaluation policy on inflation rate in West African region. There is no doubt that high inflation rate ensued from both Consumer Price Index and Producer Price Index in some African countries due to the desire for foreign consumption and inability to establish functional refinery for crude oil production. This has redirected the attention of policy makers on various factors that contribute to this devastating situation. This study contributes hugely in this regard, and factor in the price of crude oil as the producer price index in the model.

While the existing studies provide technical information and valuable trends of different behaviour of inflation rate in developed, developing and emerging economies, little is known about the influence of exchange rate pass-through to inflation rate in the region of West Africa. This current study has argued that the factors influencing inflation rate in West African countries are not limited to money supply but also the appropriate exchange rate policy and some other control variables. This has been upheld in the study by Ogundipe and Egbetokun (2013), which stated emphatically that the rate of inflation was attributed to the exchange rate fluctuation than the actual money supply as assumed in the Fisher's theory of money. However, despite the huge empirical evidence in developed and emerging economies, there are still little studies that have clearly identified monetary and fiscal policy complementary and influence of exchange rate on inflation rate in the West African region.

In an attempt at improving the existing studies methodologically and fill the existing gap in the method of analysis, this study has argued that the assumption of linear relationship found in the

existing studies is not the true conclusion and must be the reason for various policy issues in West African countries. Empirical evidences have supported the linear interaction between money supply, trade deficits and inflation rate in emerging market economies (Nair, Rabiunnesa & Mahamuda, 2018; Amiri & Talbi, 2014; Kaouther & Besma, 2014). However, the recent trends of inflation rate in many economies of West Africa have triggered the researchers to ascertain appropriate method and model to analyze the available data for proper policy implication. This study assumed that the connection between exchange rate fluctuation and inflation rate is non-linear; and using linear method of analysis, may provide unreliable, spurious and confusing results. It therefore assumed that the existing studies failed to provide adequate findings about the depreciation and appreciation of currency in the model and how it influenced the rate of inflation. In order to contribute to this methodological gap, this study through new data, has provided new analysis and focused on using non-linear approach in measuring the influence of exchange rate fluctuation on inflation rate in West African countries.

In addition, this study has deepened the empirical analysis by modifying the existing scholarly methodology and show the various ways and directions in which exchange rate instability constantly influence inflation rate in many West African countries. Furthermore, the study is motivated based on three major factors. First, the persistent lack of agreement among macroeconomic scholars on the impact of exchange rate fluctuation on inflation rate. Second, the dearth of empirical work to understand the redefined role of monetary and fiscal policies' tools as well as other control variables in the nexus exchange rate and inflation rate. Third, investigations whether findings from developed, emerging and developing countries could be replicated in West African region.

A review of literature and empirical evidences on the factors causing inflation rate have produced three schools of thoughts, such as monetarist views, fiscal imbalance perspective and the structuralist views (Mishkin,2004; Taslim, 1982; Akinbobola,2012; Chaudhry, Farooq and Murtaza, 2015; Chowdhury, Dao and Wahid, 1995). To this very end, monetarist's factor, such as the level of stock of money in the circulation and fiscal imbalance such as government spending to finance deficit budget to cushion the effect of recession has gained attention in the literature. However, the structuralists' argument concerning the influence of the cost of production has received little attention from the literature.

1.7 Scope of the Study

This study investigated the link between exchange rate fluctuations and inflation rates in West African countries covering a period of 31 years, from 1990 to 2020. The range of years was considered because of the nature of estimation that tends to ascertain the long-run interaction between the variables. The center of attention of this was to identify the role played by factors and policies influencing exchange rate fluctuation and its impact on inflation rate. The study considered macroeconomic indicators such as unemployment, growth rate, and external sector variables to validate exchange rate-inflation rate hypothesis. This study examined whether or not the occurrence of certain type of shocks have more effect in West African countries, more specifically in the CFA and the non-CFA African countries, covering all the 15 countries in West Africa as organized as follows in chronological order for identification purpose: Burkina Faso, Benin, Cote d'Ivoire, Cape Verde, Ghana, the Gambia, Guinea Bissau, Guinea, Liberia, Mali, Nigeria, Niger, Sierra Leone, Senegal, and Togo. The countries were further categorized into Anglophone and Francophone. The Gambia, Ghana, Liberia, Nigeria and Sierra Leone are grouped

as Anglophone countries, while Burkina Faso, Benin, Chad, Guinea Bissau, Guinea, Ivory Coast, Mali, Niger, Senegal and Togo are grouped as Francophone countries.

The choice of these preferred countries is premised on the fact that West African countries have suffered in the past, and are still suffering from devaluation of currency and monetary transmission mechanism issues. These years to be studied are preferred because they coincided with the period of high inflation rates and depreciation of major currencies in West African countries, and with a common agenda to have single currency for rapid economic growth. The panel data for the variables such as inflation rate (INF), exchange rate (EXR), exchange rate volatility (EXRv), monetary policy variables (such as money supply and interest rate), fiscal policy variables – public debt, government spending, and value added tax as well as macroeconomic variables (such as unemployment rate, trade openness, gross domestic product and balance of payment) were captured in the study. These variables were culled from World Bank Development Indicators for the period under review.

CHAPTER TWO
REVIEW OF LITERATURE

2.1 Conceptual Review

2.2 Exchange Rate

The cost of a country's currency in relation to another country's currency is known as the exchange rate (Rohmanda, Suhadak &Topowijono, 2014; Eneji et al, 2018). Okorontah (2016) sees exchange rate as an important macroeconomic instrument to attain economic objectives such as stability of price level, rate of employment formation, investment decisions, economic growth and development, as well as resource allocation. Exchange rate posited direct influence on the influx of capital from rich countries into poor countries (Mordi, 2006). Adaramola (2016) corroborates that exchange rate affects export and thus becomes bedrock for the economic performance globally.

A weak domestic currency value indicates currency depreciation while strong currency value implies currency appreciation. Thus, exchange rate is no other thing than a comparison between foreign currency and home currency in value. Noor (2014) in his study divided exchange rate to hard and soft currencies. It is hard currency if it originated from advanced nation such as Dollar, Yen, Pound Sterling and Euro. On the other hand, soft currency is a rarely adopted currency for payment and settlement of transactions and it often depreciates in value. Meanwhile, the rate is attributed to the direction of the market coupled with political factors playing complementary roles. Thus, an attempt at achieving stability of the currency value through various political means probing into the underlying economic forces may result in instability in the forex market and unsustainable rate of exchange. For instance, an increase in terms of trade, (TOT), may lead to

declined output in the non-tradable sector, thereby causing excess demand and shifting internal and external balances locus upward. It is, therefore, necessary to achieve exchange rate appreciation to sustain trade balance. The appreciation or depreciation of foreign exchange indicates the strengths or weaknesses of a nation's currency in comparison with others. Thus, it serves as a standard measure for competitiveness of local industries in the world market.

Currency Devaluation

Devaluation of currency is usually viewed as an appropriate response to macroeconomic shocks that affect a country's competitiveness, nominal prices and wages (Korinek &Serven, 2016). The policies of exchange rate of West African countries are controversial and sensitive due to their required structural transformation such as; imports reduction or risen exports which may be termed as nominal exchange rate depreciation; whereas such adjustments may result in fluctuation in foreign exchange and affect exports negatively within the short period (Thi Thuy &Thi Thuy, 2019). The arrangements of foreign exchange can be divided into three broad categories which include (i) agreement in relation to fixed rate (ii) arrangements on flexible rate, (iii) consensus on benchmarking the flexibility. Each arrangement takes different methods to which countries participate and influence their forex markets. The apex bank may involve in the markets while fixing exchange rate against other countries' currencies. However, it may completely abstain from the market intervention of foreign exchange when adopting the choice of float rate of exchange. A country may choose to manage their exchange rates based on their desire for flexibility (Thi Thuy &Thi Thuy, 2019). Hence, the different arrangement or regimes of foreign exchange rate are discussed in detail below.

2.3 Exchange Rate Regimes

An exchange rate regime involves a system employed by monetary authority (central bank) to determine a nation's currency exchange against other countries' currencies. Earlier, exchange rate regimes heavily relied on the gold and silver's value to determine the currency value. As such, international currencies exchange is often based on the bullion value (James, Marsh & Sarno 2012). The gold standard is a system where all countries fixed their currency value in relations to the specific amount of gold. The local currencies were converted freely into gold as stipulated price without any restriction. The restrictions of the capital movement have been considered as a major challenge of exchange rate determination in the 1970s (Ucan, Akin & Aytun, 2014). Since the 1980s, exchange rate arrangement and global monetary system have been put into practice by many countries. The history of Gold standard emerged from the classical point of view in England during 1817, when silver coins were valuable. The Silver coin is a subsidiary currency established as fiat money. In the early 19th century, metallic content was reflected in silver standard by Japan and other European countries that changes silver and gold content. Despite the changes, the prices of gold and silver still vary across countries; depending on the rate of exchange implied by nominal values, if the difference is enormous, the law of Gresham will take place in the operation. What this mean is that, excess of bad money will erode the good money from the economy. Therefore, bimetallic is facing huge challenges with the usage of silver and gold coins as a means of transaction (Alper, 2016).

The classical gold standard deals with the symmetrical adjustment between deficit and surplus countries where a country's apex institution creates a medium for the flows of gold to control the stock of money. The use of gold standard is not peculiar to all countries except for counties colonized by Britain. In addition, county like Netherland, France, Germany, the United States and

some West European countries. Hence, gold standard became an acceptable means of exchange rate arrangement globally in 1870s due to its stability in the world economy (Moosa, 2005). However, the unexpected of the First World War is the pending of the gold standard usage temporarily. This is attributed to the large amount of money to finance military defense projects exceeding the available amount of gold to back up all the currencies. Since then, countries begin to ignore the gold standard and decided not to define their currency values in term of good; as a result, speculation of currency in the market arises.

In 1930, a Second World War resurface, and this resulted in loss in the value of British pound sterling. Hence, the Bretton Wood fixed exchange rates evolved and practiced for at least thirty years before its defunct. Developing countries, in the early 1990 were conditioned by the IMF to adopt floating exchange system to foster economic development. This was resulted from the aftermath effect of global crises and financial distress in developed and emerging economies. Meanwhile, the choice of this regime is essential for adequate security from speculative attacks, currency crisis and attainment of growth of developing economies. The openness of the economy to other external inflows of funds reflects on the policy issues in the management of currency value against others. It becomes a dilemma to make a straightforward policy without investigating the implication on other economic indicators domestically.

The polar exchange rate regimes, which include fixed or flexible currency fluctuations linked with monetary union or currency board, were advised to various nations after the currency crises of the 1990s. Due to the trilemma created by the impossible trinity concept, it is claimed that the previous regimes are no longer viable. This trilemma involves the difficulty in achieving stability in foreign exchange, autonomous monetary policy and capital mobility. These objectives will be difficult to

achieve simultaneously; at least one of these objectives must be sacrificed. Hence, the various forms of exchange rate regimes are discussed below:

2.3.1 Fixed Exchange Rate

When a country operates a system that involves home currency been tied with other independent currency, such system of exchange is referred to as fixed system. It is often maintained at fixed levels and may either be a hard peg (usually changes) or adjustable peg (occasional changes). In Post-World War II, all the countries maintaining this system of exchange rate suspended it due to the collapse of the system. Obadan (2009) states that fixed system of exchange rate is appealing to every nation due to the benefits such as reducing transactional costs; certain international dealings due to reduced risk of exchange rate; promotion of orderliness of exchange rate market; and provision of credible policy. The system of fixed exchange rate may take different forms including firmly regimes (such as monetary union, currency boards and dollarization) also referred to as hard pegs and other conventional fixed pegs like basket of currencies peg and a single currency peg. Hard pegs became popular shortly after the East Asian financial crises. Below are the highlights of the hard peg and other conventional peg system of fixed exchange rate regime:

i. Dollarization: In this system, the foreign currency is adopted as legal tender. Recently, more than sixty-five (65) nations peg their currencies to dollar coupled with seven (7) sovereign nations and five US territories adopt US Dollar as their official currency. For instance, countries like Panama and Ecuador used the U.S Dollar as their legal tender (Adkins, 2021). The adoption of this currency regime simply means the total surrender of autonomous control of monetary authorities on monetary policy.

ii. Monetary Union: This system has to do with a well-integrated group of economies that adopt the same monetary policy and created a singular currency for the Union members. In other words, all members utilize the same legal tender. For instance, there are two currency unions in the CFA Zone in Africa. Included are the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CAEMC) (WAEMU). Each union has a distinct top-level organization that issues money with a set parity to the euro. The name of these currencies is known as CFA franc, but because they can be distinguished, they cannot be freely exchanged. Just like dollarization, this also involves total surrendering of monetary policy control.

iii. Currency Boards: For the exchange of assets to which the country's currency board has picked to tie, this Board, a central monetary entity, issues local currency. This Currency Board comprises the three main types of currencies: a set of exchange rate between an "anchor currency" and the country's currency, convertibility that is done automatically. In accordance with this system, the top institution trades foreign currency that is stable with term currency at a predetermined exchange rate. In a scenario where the currency board system is strict, every dollar that is purchased is said to be equal to home currency. Meanwhile, when the board used dollar to finance deficit from balance of payment, home currency will lose value against dollar. During hyper-inflation, currency boards were introduced to implant the board reliability in the system. However, the Board can only be credible if a country's apex bank holds enough international reserves to cover the whole monetary liabilities. This will assure the entire public and financial markets that the home currency is supported with quantum of foreign currency in the government treasury. To achieve this, the apex bank must be autonomous coupled with strong fiscal position and a sound financial system (Mishkin, 2000). The benefits of currency board system include monetary credibility, low inflation and interest rates. However, Fischer (2001) argued against currency board

that it involves internal or external shock through slower inflation differential compared to nominal exchange rate. He also stressed that currency boards are prone to economic shocks for countries that have weak banking systems. With the system in place, the apex bank would exercise the right to provide lending support to both commercial and investment banks during banking crisis. Similarly, the use of financial related decision and policy implementation, that is, adjustment of cost of borrowing or lending money or exchange rate to regulate the economy will prove difficult, instead, adjustment of economy will be through price and wage adjustment which may be slower and painful. The currency board can also lead to stagnant output, unemployment, real economic cost and low demands as was the case of Argentina (Obadan, 2009).

iv. Single Currency Peg: when the use of single currency is considered, the domestic legal tender is tied with the legal tender of major business partners i.e. country or sovereign nations. Oftentimes, the most common currency been tied with is U.S dollar. Single currency tied or peg yielded a series of benefits to the countries involved. This includes diminution of unstable exchange rate among the countries involved, and enhancement of the country's confidence. The economy of the country considered the best to peg home currency must be stable and recognized as cost-effective environment. As a result, it may interfere in the macroeconomic objectives of the country (Obadan, 2009)

v. Basket of Currencies Peg: As part of the efforts of developing countries to stimulate rate of exchange for effectiveness, policy inclined countries align their currencies to the main business partners. The merits of this system include control of unstable prices emanating from changes in exchange rate. It avoids huge fluctuations in exchange rate due to business transaction among the countries. However, Barth (1992) attributed the deficiency of pegging in the basket of currencies

to technical difficulties coupled with exchange rate determination without referencing local financial policies of the monetary authorities.

vi. Crawling Peg/Crawling Band: This is the situation where there is constant review of policy within fixed and floating regimes. It is more suitable for countries that are characterized by high or significant inflation than their trading partners. In this system, the central bank fixes the rate of currency on a specific day but sporadically adjusts the rate in proportion with or in response to inflation differentials. The crawling peg accommodates various trends of inflation rates between countries while determining the future rate of exchange to the exporter and importer (Barth, 1992). However, this form of peg opens currency to speculative attack due to the commitment of government to operate at any time of the week or over certain period to determine the value of currency rate. Similarly, crawling peg imposes difficulty in the monetary policy in the same way as fixed exchange peg system. However, foreign exchange rate operates within the means of crawling bands and as a result, the currency is maintained in a specific variability margin of at least $\pm$ 1% around a central rate. Bands are usually oscillating or linear within the crawling central parity or within asymmetric bounds either upper or lower bound. In this regard, the crawling peg is synonymous to crawling band under the following attributes. First, a wide band of about $\pm$ 5% or more which geared towards achieving contra-cyclical policy; fundamental exchange rate equilibrium; and scope of market forces. The importance of band cannot be downplayed as it helps the rate of exchange to be constant and stable against highly volatile period of time. According to Obadan (2009), the following are the criteria for using a firmly fixed exchange rate regime:

a. Optimum Criteria. This implies that small group of countries are more preferable compared to the large ones. Hence, pegging to a country that is prone to asymmetric real shocks would likely create obstacles.

b. Inflation preference in the pegging country must be the same with country to which it plans to peg.

c. Floating labour markets are very essential. This is attributed to response of nominal prices and wages to adverse shock due to the fixed rate of exchange.

d. Strong, well-regulated and well-capitalized banks are unavoidable because hard peg kicks against a central bank to act as lender of last resort to local banks.

e. In adopting the hard peg system, the monetary authorities must strictly adhere to the principles that govern monetary policy.

In practice, difficulties were encountered when the pegging countries failed to adhere to the set of rules. This implies that anytime a country chooses to peg, she must do it in proper, effective and efficient manner. This means the country must either implement unambiguous principles that must be followed rigorously or adopt a sufficiently sophisticated management regime to adapt to capital mobility pressures.

2.3.2. Flexible Exchange Rate

This regime entails a system where market forces determine the rate of exchange. This entails that the force of demand and supply of currency influence a nation's exchange rate with other country's currencies. The systems allow the market forces to determine the movement of currency rate (Obadan, 2009). The best solution is to be patient to allow excess demand of goods and labour market to push prices downward. The extent of floating exchange rate rests heavily on the intervention of government in the market which may involve either clean float or manage float. If the government decides to intervene in the determination of the rate it is clean, if otherwise it is managed. Sometimes the Apex bank tries to mediate the rate in the market without a specific goal

or target. This is because government worries if the currency appreciates or depreciates to sustain competitiveness among trade partners

A controlled float includes what operates in reality and has recently gained popularity. In contrast, a clean float is typically academic in character because it is not applicable in practice. Taking developed countries, as example, they guide their currency intermittently which is an indication against free float of currency rate. As at 2004, the country that embraced guided and managed float of currency is not less than forty-eight while not fewer than thirty-six countries maintained autonomous floating policy (Obadan, 2009). Managed floating is now one of the exchange rate systems that many developing nations in Latin America, Asia and Africa found to be the most acceptable.

In 1990s, the currency crises in Latin America and Asia agreed to the shift to floating regime of exchange rate. A floating exchange rate system possesses the following attributes and benefits for the country practicing it:

i. A floating regime allows huge adverse shocks to be easily absorbed compared to that of pegged regime, therefore, less likely to cause a currency crisis. The Asian crisis started in Thailand in 1997 before spreading to neighbouring countries. It began as a currency crisis when Thailand decided to unpegged the Thai Baht against the United States Dollar, thereby setting off currency devaluations and also lead to enormous capital flight. Some of the Asian countries (such as South Korea and Japan) experienced devalued stock markets, declining currency value and increasing private debts. It was also pointed out that fundamental imbalances initiate financial and currency crisis in these countries. Immediately the crisis commenced, market overreaction and herding thrust exchange rate, asset prices and the economy activities became severe than expected due to the weak economic conditions (Corsetti, Pesenti, & Roubini, 1999). These currency problems

were attributed to various East Asian nations' fixed rate policies. Hence, pegged systems were discouraged in emerging and developing economies and replaced with floating ones.

ii. Unlike the fixed exchange rate system, participating countries are free to follow their own monetary policies.

iii. Exchange rates are able to fluctuate or alter in reaction to market conditions (i.e. force of demand and supply of currency).

However, there are various arguments against the embarrassment of floating regimes by poor or developing countries (Barth, 1992; Obadan, 2009). These include:

iv. Increase in exchange rate fluctuations can lead to adverse consequence of foreign capital inflows, especially if the foreign investor is aware that flexibility in foreign exchange will minimize country's willingness to implement restrained monetary policy.

v. In a situation where massive capital flows into a country increases because of stable environment for foreign business which is an attractive factor. Contrarily, if the irrational changes in the perception of the foreign investors occur, it may worsen foreign exchange misalignment. Thus, the developing countries are constrained and affected with variability in currency value.

vi. The floating exchange rate regime reduces unhedged borrowing by minimizing capital inflows, thereby leading to low investment and poor growth.

vii. Under flexible exchange rate regime, debt owned outside the country may constitute or contribute to financial fragility.

2.3.3 Choice of Exchange Rate Regime

Several studies have postulated that the alternative of foreign exchange regime rest on the attributes of various economies in terms of developmental stage, institutional characteristics and its structure (Bada, 2014; Esezobor, 2009). Similarly, the openness and economy's size, various classes of shocks, capital mobility as well as policy maker's credibility are to be considered while choosing the type of exchange rate regime.

i. **Openness:** Exchange rates grow greater as an economy becomes more open. Fixed exchange rates have been proposed as an appropriate option for small open economies to attract or conduct international trade in the framework of ideal currency zones. If the country succeeded in pegging, its economic structures may align with economy of the tied country and market condition. Regrettably, economy is more exposed to outer shocks if it widely opens without limits. Thus, the extent of openness provides ambiguous answers for the choice of regime of the foreign exchange (Bada, 2014).
ii. **Economic Shocks:** This is another factor that played significant role in exchange rate determination. In a situation where a country is affected by shocks from abroad, adopting floating exchange rate regime becomes essential. If the shocks are more prevalent to good market than money market, then the move to implement flexible exchange rate is encouraged rather than fixed rate. However, in a scenario where inflation-bias arise under discretionary monetary policy is huge, floating rate should be discouraged because it is not welfare enhancing.
iii. **Financial Market Development:** In a country where its financial market is still underdeveloped, it becomes difficult to adopt and operate flexible exchange rate and vice versa. The industrial nations often use floating currency regime due to the developed level of their financial markets. However, if a country's financial market is underdeveloped, dealers of foreign currency might

need to adopt different dimension of pegs. For instance, if a strong currency is pegged, it is useful to integrate and develop financial market. Hence, in developing economies especially the poor ones, financial market deepening can make it easier to operate floating rate regime (Esezobor, 2009).

iv. **Capital Flows:** The liberalization of capital control aids capital flows which in turn mount pressure on foreign exchange. However, floating rate may discourage short term foreign capital inflows and the major participants in the market will be affected by foreign exchange risk instead of the apex bank to assume the risk. Under fixed regime of foreign exchange, capital inflow will lead to downward interest rates but spur supply of funds especially when sterilization is not in place, thereby conflicting with the objectives of inflation. However, the extent of flexibility in foreign exchange rate would increase the risk premium, thus dampening interest rate sensitive and destabilizing capital flows. For instance, the experience of Poland and Czech Republic on changes of exchange rate regimes arises under the capital flows pressure (Bada, 2014). Similarly, the crisis of East Asian and Mexico in the 1990s confirms that during flexible exchange rate system, it is detrimental to open capital account uncontrollably.

v. **Exchange Rate Risk and Exposure:** By the nature of fixed regime of exchange rate, lesser risks were involved and hence it promotes trading and investment activities in the country. Similarly, another advantage attached to this type of system is the provision of stable policies such as fiscal and core monetary policies. Put differently, despite the benefit of pursuing autonomous monetary policy by countries during floating exchange rate, it exposes to greater volatility of exchange rate with greater risks. However, several studies have argued that risk involved in the foreign exchange rate transaction could be removed and most notably, crawling band and

manage float, there is tendency of reducing volatility even if the apex bank does not intervene to that effect.

vi. **A Nominal Anchor:** This occurs when the monetary authorities fix monetary policy particularly in the process of stabilizing hyper-inflation. For instance, countries like Israel, Argentina, Brazil and Mexico can only ascertain whether their monetary tools to curb hyper- inflation is effective when their currency peg with U.S dollar. Meanwhile, exchange rate as a nominal anchor can only be practiced under fixed exchange rate regime as it gives room for easy and clear monitoring commitment. A nominal anchor can be achieved through the activities of crawling band, most especially, when the bank is announced prior to the time. However, important benefits of the band cannot be overstated and one of it is the crawling parity rules that will be forfeited. When foreign exchange is flexible, the currency rate will no longer be useful as the anchor of monetary policy. In this scenario, it becomes necessary to provide effective and suitable monetary decisions by the authorities in charge. The choices put forward by several economists are of two types. These include inflation targeting and monetary aggregates. In terms of monetary aggregates, it involves a process where monetary authorities employ instruments such as broad or narrow money supply and reserve money to ensure the growth rate is attainable within the ambiance of the policy (Esezobor, 2009). Targeting core macroeconomic policy such as inflation rate requires an important instrument of monetary policy to achieve it. Contrarily, the numerical figure predicted to be achieved as benchmark for inflation is announced through the public coupled with the institutional arrangement or commitment of the government to achieve the targets. Recently, inflation targeting has become famous among the developing or emerging economies compared to monetary aggregates as anchor (Velasco, 2000). This is because inflation targeting avoids time inconsistency that could lead to bias of inflation while preventing the

deficiency of fixed exchange rates; it has some attributes of hard peg such as observability and transparency; and inflation targeting also provides less inflation volatility compared to monetary aggregates.

vii. **Autonomous Policy:** Monetary policy independence/autonomous is not often found, when it comes to the fixed rate regime. However, self-regulating is mostly found under floating exchange rate regime. It was argued under floating regime that monetary policy is appropriate in steering domestic economy and given the theory of unholy trinity (inability to achieve fixed rate of exchange, free mobility of capital and a national monetary policy), the best choice is to forgo fixed exchange rate.

viii. **Misalignments of Foreign Exchange Rate:** This is another factor to be considered before choosing a specific regime by the policy makers. Exchange rate misalignment is usually expressed as exchange rate volatility over a short period, and also involves in large and prolonged exchange rate disequilibrium which has serious and negative effect on the economy. Meanwhile, devaluation of currency could have adverse effects on the prices of exports, imports, financial solvency, external debt and overvaluation of currency. In a similar manner, currency overvalues can build-up foreign debt and undermines international trade competitiveness (Bada, 2014). Majorly, floating regime have been repeatedly associated to the emergence of misalignment as experienced by the US dollars shifting from currency overvalue in the mid-1980s to currency undervalue in the early 1995 and subsequently move to overvalue in the early 2000s. In 1980s, pound sterling witnessed a period of overvalue of currency; all East Asian experienced undervalue of their currencies immediately they engaged in floating of exchange rate; and Nigerian naira also witnessed several periods of undervaluation and overvaluation, especially during the oil boom in the 2000s. Hence, in order to avoid misalignment of currency, managed

floating is more preferable to free floating. In doing this, monetary authorities tend to reduce or limit short-run volatility by managing currencies without any public announcement; however, they must make periodic and fair changes in response to the forces of the market. Fixed regime of exchange rate could result to misalignment. This can be attributed to huge terms of trade and high inflation rate in a country compared to the country whose currency is pegged. In the overall, a crawling band seems to be more appropriate and efficient to limit misalignment. This is followed by managed floating rate, fixed rate of exchange and free floating, but free-floating rate is more susceptible to large misalignment of foreign exchange.

ix. **Vulnerability to Economic Crisis:** This factor also drives the choice of the policy makers while choosing the best and suitable regime of foreign exchange for a country. The previous economic and financial crisis, especially that of 1990s exposed the exchange rate regimes to crisis due to huge degrees of investment streams under the force of globalization. Majority of the middle systems provided upheaval is prone to the mobility of capital while exchange rate peg was vulnerable to the speculative foreign capital flows. Meanwhile, it has been proved that currency board of fixed rate system is less prone to economic crisis due to its attributes of stabilization and defense of foreign exchange rate as a case of Hong Kong and Argentina. However, the task of stabilizing and defending foreign exchange is costly in terms of recession and unemployment, still currency boards turn out to be the most effective means of protecting or defending exchange rate.

2.4 Inflation

The attainment of price level stability has continued to be the goal of any government of the world. The recently concluded economic recession has revived several arguments on stabilization of inflation rate and the activities of apex banks in achieving its objectives. Inflation is viewed as the continuous upward movement in the aggregate prices of country's basket of goods and services, and within a certain stipulated time. Intrinsically, inflation is directly related to money, as captured in the general maxim 'Too Much Money Chasing Fewer Goods' (Piana, 2001). Inflation is the continuous surge in the prices of commodities and services in an economy, according to Ojo (2000). Thus, it can be deduced that inflation occurs when the money supply exceeds the production of goods and services within an economy. Ahmad and Ali (1999) elucidate that inflation determines the effectiveness of government policies and hence acts as guide to changes in price and in most countries, the apex bank take cognizance of the inflation rate to achieve price stability. Abdurehman and Hacilar (2016) corroborate that inflation is an economic indicator which directly influences the state of the economy through interest rate, consumer prices, financial market, including foreign exchange, bonds and stocks. Coman and Pop (2015) also sees inflation as an imbalance in every economy which represents a persistent rise in prices and subsequent declines the citizens' purchasing power. No wonder, Valeanu (1992) refers to inflation as a complex and controversial concept.

In spite of the universal usage of inflation, one cannot concretely ascertain on definition to explain the concept of inflation which provide difficulty in making appropriate tools that will manage it (Woolford, 2005). In the earliest years, what was attributed to the price level is commonly and theoretically based on quantum of money in the circulation. This could be in form of minimizing

currency value in terms of exchange rate adjustment, or enhancing amount of convertible asset within the short period in the economy without a proportionate upsurge in goods manufactured. Steiner (2017) affirmed that inflation is the rate of change in the local money stock. Chitu (2016) revealed that inflation rate influences a country's economic condition and it allows a country to focus on minimal monetary policies due to moral hazard (Shrestha & Semmier, 2015). Konny, Williams and Friedman (2019) posit that the amount of money paid by consumer on change in the prices of commodities is too high during inflation. Thus, inflation is characterized by a decline in local currency value and a surge in exchange rate in relation to other country's currencies. According to economists, inflation is of different kinds. These include shock inflation, steady-state inflation and pure inflation (Anyanwu & Oaikhenan, 1995). A rise in the price of a necessary good or production input is what is referred to as "shock inflation," which is an abrupt change in the level of general prices (including wages). It primarily has to do with supply shocks and declines in real income brought on by shifts in the relative pricing of components compared to the prices of goods. It frequently occurs in sporadic spouts. For instance, shock inflation is primarily arisen from a sharp decline in the relative value of a nation's currency (Anyanwu &Oaikhenan, 1995). Similar to stagflation, steady-state inflation is an ongoing increase in average prices rather than a shift in relative prices over a set period of time. It concerns the inflation rate that remains aftershock inflation has been eliminated. In actuality, the value at which a variable finally settles after being perturbed is its core or steady-state. As a result, the inflation rate is said to be in its steady state if it has reached a specific amount. Moreover, all prices, coupled with wages and other incomes that rise at the same rate, are included in pure inflation. These days, inflation is viewed by the economists as a persistent rise in the aggregate and general prices (Anyanwu & Oaikhenan, 1995).

2.4.1 Types of Inflation

According to neo-Keynesians, there are three main forms of inflation identified by Anyanwu and Oaikhenan, (1995).

i. Demand-Pull Inflation: This form of inflation occurs when excessive demand does not match with rise in supply. In this situation, too much money is chasing fewer goods. This phenomenon is also called the 'Phillips Curve Inflation'. The output gap may be from the increasing expenses of government, surge in foreign price level, or higher money supply. This incidence occurs in Nigeria for instance, during the Biafra-Nigeria war and after the award was given out in 1974 called Udoji salary. This means that increment in wages upsurge the power of consumer to consume more goods and led to more demand for goods. Therefore, increase in the prices is linked with pull up in demand for goods. The figure 2.1 below illustrates demand-pull inflation.

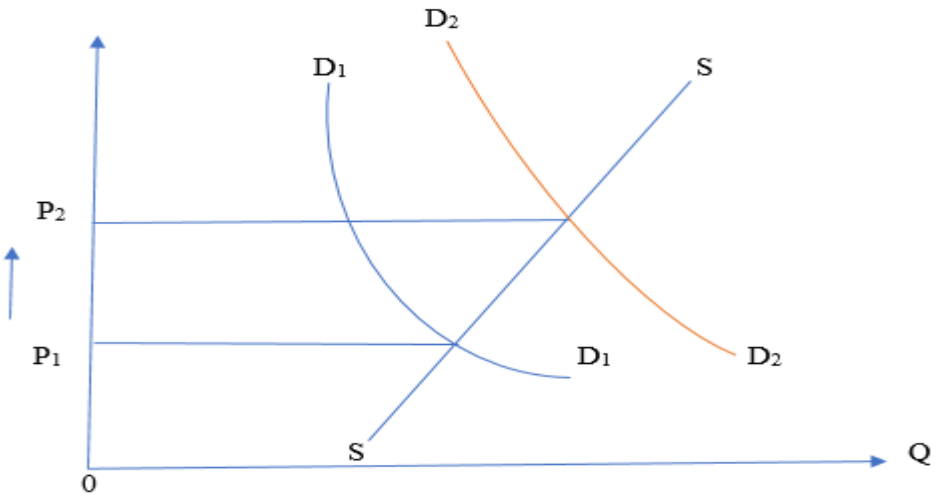


Fig. 2.1: Demand Pull Inflation
Source: Anyanwu 1995

As stated in the figure above, demand shift from D1D1 to D2D2 while supply remained constant, thus causing price to shift from P1 to P2.

ii. Cost-Push Inflation (Wage-Price Spiral Inflation): This kind of inflation is brought on by rising manufacturing costs, particularly rising wages. Commodity inflation is another name for this type of inflation. For instance, if workers' living expenses unexpectedly rose and they demanded and received wage increases, the cost of manufacturing would rise. The cost of the items that people must purchase will reflect this. Because the first raise has been reduced by rising prices, it makes workers want more money going forward. In actuality, the cycle will continue, and prices will rise. Cost-push inflation is further explained in figure 2.2 below.

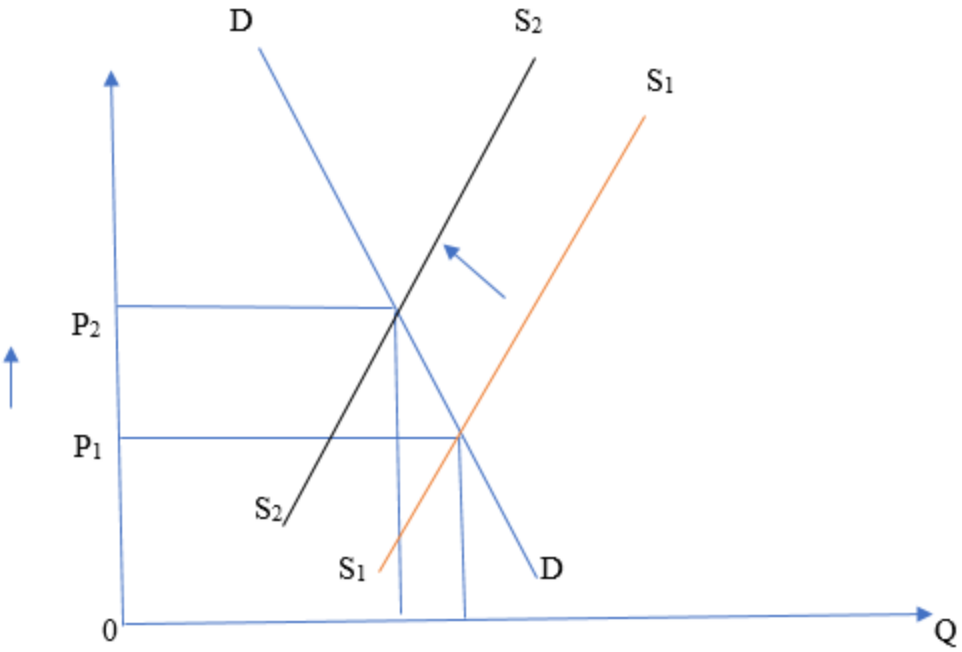


Fig. 2.2: Cost Push Inflation
Source: Anyanwu 1995

According to figure 2.2, the supply fell from S1S1 to S2S2 therefore resulting in higher prices. Here, the price increases from P1 to P2.

The supply shock, often known as cost-push inflation, when there are no viable alternatives, inflation frequently results from a rapid decline in overall supply, which forced the goods' prices to increase. In the recent time, the upsurge increase in the price of housing across countries,

coupled with food prices and electricity bills contributed to the cost push inflation. Price/wage spirals in businesses are common examples of this.

iii. Structural Inflation: The third form of inflation is known as built-in inflation, usually induced by the adjustment in supply and demand structure. Under this form of inflation, some branches of the economy will witness demand hike for their goods and services while others experience falls in demand. Hence, the wages and prices in branches that reduce their production will be reduced while prices and wages of branches that increase production will increase; then the overall level of wages and prices will grow. Succinctly put, structural inflation occurs when the manufacturers or producers cannot respond to structural changes of an economy through efficient productive output (Yeldan, 1993).

Within the broad variants of inflation, there are other forms of inflation with varying effects, determinants, and remedies, which are categorized based on severity, intensity, and continuous price hike (Woolford, 2005). These include:

iv. Walking inflation*:* This kind of inflation occurs when prices rise moderately, and annual inflation rate is a single digit. It occurs when the rate of increase in prices is between 3 and 10 %. It also drives demand even further, in which the suppliers cannot keep up. Consequently, common commodities are priced out of the reach of most people (Woolford,2005)

v. Creeping inflation: This is otherwise known as mild inflation. Its rate often hovers between 2% and 3%. When price rises to 2% or less, it is beneficial to the growth of a nation. This is because mild inflation predicts the prices that may continue to rise. Meanwhile, in order to plan for the future prices, consumer may buy in the present time against increase in future prices. By rising demand, creeping inflation drives economic expansion.

vi. Galloping inflation: This kind of situation occurs when rate of inflation attained a benchmark of above 10%. This situation causes are detrimental to economy progress. More often than not, the currency loses value speedily to the extent that business and employees' income meet up and equivalent with the market price of a commodity. Similarly, international investors often ignore counties that have sporadic inflation rate which limited the amount of capital inflows. Hence, the country lost credibility and attractive factors to lure foreign investors (Anyanwu, 1993). Galloping inflation requires immediate intervention to guide against hyper-inflation.

vii. Hyper-inflation: This occurs when inflation rate moves upward speedily to the extent that a rise in economy's output is virtually impossible due to the breaking down of monetary mechanism. This can be seen when inflation skyrockets more than 50% within a month. This situation rarely occurs in real sense. In fact, several instances of hyper-inflation occur when the central bank recklessly print money to fight or prosecute war. Examples of hyper-inflation include Zimbabwe in the 2000s, Germany in 1920s, and during the American Civil War. To minimize or put an end to hyper-inflation, the government must slow the rate of financial expansion. Majorly, most hyper-inflation started if the government collects too little tax income to match its spending level. Though the management may have a preference to backing financial plan deficit by raising debt within and outside the country, it may find it hard to borrow because most lenders view government borrowing as low returns. To bridge the deficit, the government can turn to only mechanism of printing currencies, thus the rapid money growth. Once the hyper-inflation occurs, real tax revenue decreases as inflation rises as a result of the delayed tax payment collection, making the fiscal situation even worse (Woolford, 2005). Hence, there are various ways of measuring inflation but the most common inflation measurement includes Consumer Price Index (CPI), Wholesale Price

Index and GDP deflator. Among the three, the famous and generally acceptable index is CPI as reported by Shah (2021).

viii. Consumer Price Index: This index measures the price that is averagely paid by the consumer for a basket of any kind of commodities in a given period of time or services enjoyed. These services and commodities can be divided into eight categories which include food and beverages, housing, education, transportation, medical care, apparel, communication and recreation (Shah, 2021). Hence, an amendment to the price of products and services reflect the in the CPI index. According to Anyanwu and Oaikhenan, (1995), CPI is computed by subtracting previous year Consumer Price Index from the current year and divided by the previous year's CPI. However, some economists have argued on whether CPI measurement of inflation understates or overstates. Nevertheless, the appropriate proxy for inflation is CPI and how it is being measured. This is because CPI is not a price level indicator due to its concentration on price changes in the economy. For instance, if the price index of butter is 120 and that of bread is 150, it does not connote that price of bread rises more than the price of butter at that particular time. Similarly, CPI does not consider the changes in the quality of goods because it only calculates pure price changes and ignores changes arising from the variations in the quality of items. Furthermore, CPI is also affected by substitution bias because it does not take cognizance of changes in the spending pattern of the households and of which, in most cases, households often change the amount spent on various items.

ix. Wholesale Price Index (WPI): This index measures changes in price of the traded and sold in bulk by the wholesale businesses to other businesses. Unlike CPI, WPI captures the price of commodities and services at the factory gate prior to the retail price. WPI is usually seen as the indicator of inflation in an economy. In most cases, WPI is often reported on a monthly basis to

reflect average changes in prices of commodities; and the cost of goods considered in a year is compared with the cost of goods in the base year (Woolford, 2005).

x. GDP Deflator: This is also known as implicit price deflator. It involves the percentage or ratio of the value of services and commodities produced within a year in a country for a specific price in comparison to the price obtainable for the base year. The index assists in showing the extent to which Gross Domestic Product (GDP) rises due to increases in prices rather than increased output. GDP deflator is considered as more comprehensive method of measuring inflation because of its coverage on the entire goods and services manufactured as against basket of goods and services considered by the consumer price or wholesale price indices (Srihari, 2018).

2.4.2 Causes of Inflation

According to Anyanwu and Oaikhenan, 1995, the general causes of inflation include:

i. Excess Money Supply: Extant literature has established that the amount of money left unproductive in the circulation pushes the inflation upward in a country. The perfect example of this is when Nigerian government bestowed award on workers and injected huge amount through civil servant called Udoji salary in 1974 and upward review of minimum wage in 1981 led to inflation (Anyanwu & Oaikhenan, 1995). In addition, if the monetary authority exercises their right to use follow expansion policy to enhance availability of funds in the economy, it can contribute to inflationary pressure.

ii. Declined Supply of Commodities: Majorly agricultural products are often abandoned in some West African countries especially oil producing nations like Nigeria. The majority of agro-business is presently done by aged farmers which led to shortage of farm produce due to low productivity. This shortage of goods is one of the major factors influencing inflation in African

continent till today. Indirectly, if workers demanded for higher wages, it triggers company to reduce commodities supplies due to increase in variable cost of production (Srihari, 2018).

iii. Budget Deficits: Budget deficit is not new issues among West African countries. This is attributed to huge enlargement in government spending on growth programs and other investment which in turn led to high inflationary trends.

iv. Imported-Inflation: Almost all West African countries fully concentrate on imported goods from other nations; these activities transferred into home country, the inflation situation in other countries. Hence, it results in direct importation of higher prices into the country (Woolford, 2005).

v. Rural-Urban Migration: The mass movement of people from the rural to urban area has reduced the attention towards agriculture. Moreover, the little commodities available in the urban city have high demand hence, inflation arise.

vi. Population Growth: The rise in population of West African countries especially Nigeria and the complete world has worsened the situation of stable prices. Whereas, the large chunks of the populace are weak because they fell under the categories of unproductive population. The increasing rate of dependents on working labour force put pressure on the available commodities, thereby resulting in inflation in the country (Anyanwu & Oaikhenan, 1995).

vii. Tendency of Monopoly and Activities of Middle-Men: As stated by Safi and Mashal (2020), another rationale behind an upsurge in the prices of commodities is the presence of market monopoly. Anytime, the suppliers of a product or service are in tough competition with the passage of time and dearth of effective regulatory framework and implementation by the government, the competition stops at market and monopoly comes into existence. Oftentimes, this scenario results

in higher prices of goods and services. Similarly, there are too many middlemen in the distribution chain. These are the people who exploit and hoard available goods and create black markets in order to sell at higher prices to earn higher profit.

Furthermore, others who have backup from the government monopolize supply of essential goods, thereby charging exorbitant prices than what ought to be.

viii. Excessive Demand: Increased purchasing power of consumers will lead to high demand for goods and services. This could be as a result of higher wages from frequent upward adjustments of salaries and wages, hence, inflation occurs.

ix. Increased Costs of Production: As wages increase in a country, cost of production increases. These may affect production, thereby resulting in inflation. Increased cost of production shifts to the ultimate resting place (consumer) in form of hike prices on goods and services (Srihari, 2018)

x. War-Caused Inflation: During wars, government's expanded more funds into war equipment rather than production productivity. The labour that would have produced goods is deployed to war fronts, as a result, demand exceed supply thus, inflation occurs.

xi. Seasonality: In most cases, this is applicable to agricultural products such as vegetables and fruits. Once, the supply of these products is out of season and the demand remains unchanged, then, inflation will occur in the country.

xii. Shocks to the Economy: Anytime an economy experiences shock, high inflation tends to rise. Shocks to the economy may come in different dimensions, such as supply shocks, demand shocks

and natural disasters like floods that can destroy arable lands, and insects which affect crops among others (Safi & Mashal, 2020).

2.4.3 Control of Inflation

The apex institutions (also known as Central Bank) and/or the government usually monitor and control inflation in the country. Some of the economic policies employed by the monetary authorities include monetary policy, fiscal policy, trade and income policy, exchange rate policy (Anyanwu, 1993). However, some policies such as trade and income policy and exchange rate policy have been embedded in two traditional macroeconomic policies (fiscal and monetary policies). Hence, the study emphasizes on the general policies that are common among West African countries.

i. Fiscal Policy:

For public activities, there is a set of rules and law guiding every decision in relation to revenue generated and how the funds are distributed across different activities. However, when there is a gap between what is to be earned and spent, and then there is a law guiding the government borrowing to make it up. This is the policy of the government with respect to the extent of public spending (on goods and services bought, and on transfers), debts and the tax structure. This implies that government deals with three major macroeconomic activities, including expenditure on goods and services (G) and transfers (R); Taxing (T), and borrowing (B) (Anyanwu, 1995). In the words of Agu, Okwo, Ugwunta and Idike (2015), adjustment to government spending in response to tax rate to direct the economic activities is known to be fiscal policy. Makhoba, Kaseeram and Grayling (2019) explain that fiscal policy entails trio policy which are spending, borrowing and revenues for main purpose of attaining the set of macroeconomic objectives. Fiscal policy as stated

by Fashola (2000) is the plans of government to meddle the circular flow of income and expenses to achieve price stability and full employment in the economy. Ilemobayo (1997) corroborates with the existing assertion on fiscal policy concept to reduce inflation, promote competition by curbing private monopoly, protect infant industries against giant firms, correct balance of payment distortions and enhance public sector growth. According to Ogunbi and Ogunseye (2018), fiscal policy can be categorized into two; expansionary and contractionary. It is expansionary fiscal policy when government increases the volume of money in the circulation by reducing tax rate and increasing government expenditure. Expansionary fiscal policy is often used to tackle negative effect of recession or cyclical downturn. The goal is to stimulate the economy by increasing aggregate demand. However, contractionary fiscal policy occurs when government decides to reduce money in the circulation. It is a restrictive form of fiscal policy used to control demand pull inflation. The aim is to minimize the pressure of aggregate demand that increases the general prices of goods and services. Contractionary fiscal policy can be achieved by reducing public expenditure or rising taxes or both. The Keynesian economists argued that demand pull inflation emanates from excess aggregate demand over aggregate supply. Hence, fiscal policies and initiatives are the weapons for managing demand pull inflation.

Basically, there are various instruments used to exercise the government fiscal activities. These include tax, government expenditure, government debt, government budget, as well as import and export as stated by Ogunbi and Ogunseye (2018)

Tax: This is the most important source of government revenue, being a mandated tax that the government imposes, regardless of the precise value of the service provided to the tax payer in return. It is also a requirement that people pay taxes to the government in order to cover costs

incurred in the interest of everyone, regardless of any unique benefits received. (Adewoyin, 2010). Ogunbi and Ogunseye (2011) also explain taxation as a compulsory levy by government on firms, legal entities and individuals without 'quid pro quo'. The word 'quid pro quo' implies tax payer does not expect any direct service in return for the tax paid. Hence, higher income tax can reduce the purchasing power of an individual, thereby minimizes inflationary pressures in the economy. In a case where there is an increase in demand due to high individual spending, the effective means of managing such inflation is by taxing profits. Taxing private income reduces disposable income, thereby minimizes consumer spending.

Government Expenditure: This is an expense incurred by the government to provide and protect the economy and external bodies. According to Anyanwu (1993), government expenditure can be of two forms which are transfer payments and expenditure on services or commodities. Government paid for goods and services as resource-using or exhaustive/absorptive expenditures because they entail the reallocation of funds from public coffers to several private entities in return for goods and services. When government spends money, they do not only provide goods and services but also has direct impact on the entire economy. Examples of transfer payment include pension and gratuities, social security benefits, debt servicing (interest payment and capital repayment on debts) among others. Government spending can further be classified into two groups such as capital and recurrent expenditures. Expenditure is capital in nature if its benefit is not exhausted within the current year but enjoyable over a long period of time. Such expenditure is incurred on capital assets such as construction of roads, bridges, electricity project, seaports, schools etc. Contrarily, recurrent expenditure means monies spent on commodities and services by the government that is beneficial to the people. It takes place during the course of the year (Adewoyin, 2010).

Public Debt: This is the money borrowed by the government through its apex bank to finance developmental project or to support balance of payment of the country (Ogunbi & Ogunseye, 2011). Government often embarks on borrowing to align and balance the outstanding between income and expenditure to protect the country during unexpected incidence such as war and natural disasters, functional financing, and project that can speed up capital formation and economic growth. Government uses debt to regulate the economy, especially to control inflation. In cases where government realizes that there is much money in circulation, they will issue the instruments of debt such as government development bonds, treasury bills, and treasury certificates to the citizen in order to raise more funds, thereby reducing minimizing funds in the economy and vice versa.

Government Budget: This involves a document presenting estimated revenues and proposed expenditure of the government for a fiscal year usually passed by the legislature, presented by the finance minister and approved by the president of the country. It is simply known as an annual financial statement of a country. Budget can either be deficit, surplus or balanced. It is surplus if the estimated revenue exceeds proposed expenses. Budget deficit occurs when proposed expenses is greater than projected revenue while balanced budget arises when government spending equates its income for the year (Ogunbi & Ogunseye, 2018). Government can manage or control inflation through annual budget by adjusting its estimated expenditure and taxes for the year.

Imports and Exports: Government can also use imports and exports policy to monitor and control inflation in an economy. Imports involve the activities of importing products and services from the residents abroad while exports entail goods and services produced shipped to other countries

for sales or trade. In today's economy, consumers are often used to seeing variety of products in the grocery stores, especially the foreign products. These oversea products gave them privilege to make choices because they prefer to go for cheaper and oversea products compared to their locally made goods. Hence, in a situation where there are many imports over exports, it can result in balance of trade distortions and devalue local currency. And currency devaluation can have greater influence on standard of living of the citizen because currency value is one of the determinants of economic performance and price stability. Thus, maintenance of appropriate balance between exports and imports becomes a crucial task for every government to avoid incessant increase in general price level (Adewoyin, 2010).

Succinctly put, control of aggregate demand is very essential for inflation to be minimized or controlled within the economy. When demand is too high, government may choose to tighten fiscal policy either by decrease in spending on merit and public goods as well as welfare payment; or increase direct taxes in order to minimize disposable income.

ii. Monetary Policy:

This policy is seen as a sister strategy to fiscal policy. It deals with the financial markets and constitute measures adopted by the authority that is controlling the money in the circulation in a way that certain macroeconomic goals will be achieved (Ezeugoh, 1987). Anyanwu (1993) views monetary policy as deliberate efforts of the government through its apex bank to circulate the available funds by setting condition for credit facilities with the intention of achieving certain broad/macroeconomic goals. The apex institution (central bank) is vested with the power to conduct monetary policy (Ajayi & Atanda, 2012). According to Jhingan (2011), protection of stable prices, attainment of full employment, achievement of equilibrium balance of payment,

equilibrium level of income and economic growth are main objectives of monetary authority. To reach these set goals of the government, there are two major tools of monetary policy as postulated by Ogunseye and Bada (2012) which are interest rate and supply of money.

Circulating money in the economy is determined by using the combination of qualitative and quantitative instruments. Open market operation is one of the tools of quantitative instruments but not limited to it rather it included reserve requirements, special deposits, and stabilization of securities among others while qualitative tools involve selective credit control and moral suasion. Monetary Policy Rate (MPR) otherwise known as interest rate, is also among the qualitative tools which in banking practice, is referred to as "barometer around which other rates of interest gravitate". Thus, the apex bank uses MPR to regulate other interest rate in the economy; the higher the rate, the lower the possible loan to be gotten from the banks. This is why it is used to regulate the volume of money in circulation. Similarly, high interest rate may lead to exchange rate appreciation because it will bring down the cost of imported goods and decline the demand for exports. The monetary measures to control inflation include:

Management of Credit: Monetary policy is an essential monetary intervention as broader strategies are adopted by the apex banks to volume of credits. On this note, securities are sold in the open market, bank rate and reserve ratio are raised, and other relevant steps were taken to control consumer credit. However, monetary policy strategies can only be effective when inflation is caused by demand pull and not cost-push.

Currency Demonetization: Another crucial step of monetary policy is to demonetize higher currencies denomination. This step is often taken when a country is experiencing surplus of black currency.

Issuance of New Currencies: The method is the most drastic monetary measure. The process involves exchanging of new currency notes for old ones. Such measure is considered when the issue of currencies is excessive and hyper-inflation pops up in the region.

Due to the conflicting objectives of monetary or unsuccessful target of some monetary aggregates like nominal exchange rate in some part of the world (such as Sweden and United Kingdom), another construct of monetary policy approach is known as Inflation Targeting. The policy was first implemented in United Kingdom in 1990s and later adopted in other countries like New Zealand and Canada (International Monetary Fund, 1999). The use of inflation targeting is apex bank approach set for inflation rate for a certain period and publicly announces it to the citizens. A central bank practicing inflation targeting policy will increase or reduce interest rates based on its plan. It is assumed that what monetary policy can do to attain desired and inclusive growth is based on stable price and inflation reduction or anchored.

Guiding policy makers in setting policy to stabilize inflation is very important in a country that had used foreign exchange rate to break inflationary trends within the long period and necessitates use of Inflation Targeting. This is the case of Turkey and Brazil (OECD, 2021). A country like Indonesia also adopts inflation targeting due to her experience of monetary targeting in an unstable monetary demand environment. Although Inflation Targeting was implemented in many countries under examination, the preconditions connected with this policy has not been satisfied or fulfilled. There is consensus that Inflation Targeting should not only focus on formal target, but also the apex bank needs to develop its internal and forecasting ability and set in motion for formal reporting of the decisions to the public.

In Africa, Inflation Targeting was formally introduced and implemented by South Africa in 2000 while Ghana also adopted it in 2007 to control interest rate within short period and keep inflation rate in accordance with a specific target. This summed up the number of African countries to two nations that used Inflation Targeting (Heintz & Ndikumana, 2010). Until recently many of African countries are yet to implement full flesh of the policy but some set certain range from 4% to 6% and the apex bank usually use instrument like interest rate to keep the country's inflation within the target.

The policy allows central bank to possess the attribute of accountability, evaluate its performance in achieving the target, and give justifications for any deviation to the public. Oftentimes, the framework involves legal and institutional changes which enhance the central bank independence (Epstein & Yeldan, 2008). In inflation-targeting framework, the prediction of inflation becomes paramount in monetary policy. However, adopting inflation targeting has nothing to do with permanent rule or lack of using innovation to reduce inflation rate but to follow a recommendation strategy (Muhanna, 2006).

2.5 Theoretical Review

2.5.1 Theories of Exchange Rate

International economics is centered on two broad categories, namely; cross border trade and global monetary economics. The field of cross border trade is based on international movement of factors and commodities, while global monetary economics is focused on the monetary aspect of international relations. Both fields have underlying analytical structures upon which researches are based. While cross border trade has various theories upon which various questions can be analyzed, there is no international monetary economics; instead, there are various bodies of theory which are useful in dealing with a certain range of question (Krueger, 1969). On the empirical point of view, balance of payment hypothesis was constructed to provide adequate answer and explain how cross boarder activities affect exchange rate. The approach is not limited to balance of payment model but purchasing power parity and monetary approach were found to be relevant in the explanation of this phenomenon.

i. Purchasing Power Parity (PPP) Theory

A unit of one country's currency will have comparable purchasing power to that of the other country under the simple theory of purchasing power parity (PPP). This is known to take cognizant of nominal value of two country currencies which should be equated in ratio of their general price levels. The PPP exchange rate is also viewed as the rate of exchange between two currencies that, if stated or measured at a similar/common currency rate, would equal two national price levels, at the purchasing power of a unit of currency that is comparable in both economies.

In Spain, there exists Salamanca school in the late 16th century. One of the renowned scholars, Professor Gustav Cassel proposed purchasing power model in 1918. This was the start of PPP before modern thoughts built on the existing model to explain parities between two currencies after

the First World War. Due to the fact that several nations that abandoned the gold standard in 1914 saw a sizable difference in their inflation rates during and after World War I, some adjustments are necessary (Cassel, 1918). Since then, the PPP has become an integral part of many economists' worldviews.

Many economists have seen PPP as an instrument for real exchange rate, hence the question of how the adjustment of exchange rate as central to the policy of foreign exchange remains unsettled. This is because countries with a fixed rate of exchange would like to know the position of exchange rate equilibrium and countries with floating rate may wish to know the level of variation in the nominal and real foreign exchange rate to be expected. The rationale behind the PPP is that, a unit of currency one can use to purchase certain goods and services in one country should be equivalent to the foreign currency's amount. Thus, there will be equality in the purchasing power of the currency unit of the two countries. For instance, if a certain product can be bought with $1 in USA and a similar worth ₦680 in Nigeria, then it became crystal-clear that ₦680 in Nigeria can only be equated with one dollar. Hence, while the currency value expressed in relation to another currency, the market condition popularly known as flexible rate of forces of market supply and demand influenced the rate.

Absolute and relative PPP were identified as forms of PPP versions in the previous studies. However, the strongest form of PPP is known as absolute PPP which involves a one price law for two countries involved. In practice, absolute PPP does not usually hold due to the following reasons:

First, arbitrage is abolished due to non-traded goods unavailability. Second, prevalence of cost both transaction and information costs, taxes, tariff, transport cost and other non-tariff barrier.

Third, the compositions of basket of goods which encompass in the measurement of prices are dissimilar across the countries especially the consumer-based as against the producer-based price indexes. Lastly, the obvious reason is that exchange rate is not constant due to sticky aggregate prices. Meanwhile, it is influenced by money shock or shock emanated from long run activities.

Secondly, Relative PPP is another form of PPP. This takes cognizance of inflation parity which means the two countries must adjust rate of exchange to take account of discrepancies' in their inflation figure.

The second version of PPP is the 'Relative PPP'. It means that the two countries' exchange rate must change to account for disparity in their rate of inflation. This means monetary authorities with different inflation objectives are expected to witness differences in their countries' foreign exchange movement. 'Relative PPP' can also be viewed when the depreciation rate of a currency in relation to another currency matched the disparity in general price levels between the two countries (Sarno & Taylor, 2002).

However, in spite of the general acceptability of PPP postulations, the theory had been criticized on the ground that currency value can also be determined by forces such as tariff structures, speculation, and capital flow among others. Therefore, there is no direct connection between foreign exchange rate and purchasing power of the currency. Also, exchange rate should be related to the price indices of global traded goods. Furthermore, Keynes considered PPP to be an empty truism especially when it relates to commodities traded globally.

Apart from Cassel's Relative PPP theory, the linkage between inflation and exchange rate was also explained by Dornbusch (1987). He talked about how import volume, import substitute, market

density, and local production channel have direct link with the forces that propel effective relationship in between inflation and exchange rate. Stevenson (2000) and Agenor and Montiel (1996) highlighted four main methods of transmitting how exchange rate fluctuation influences inflation in an economy. First, when the economy is opened, imported substitute products and goods meant to be traded are largely affected directly. Second, exchange rate directly leads to price hike of final goods through the prices of imported inputs. Third, unstable exchange rates and uncertain foreign currency prices can also influence local price makers and, in turn leads to increase in local prices. Finally, it also leads to price hike by the means of wages.

Furthermore, external problems such as fluctuation in foreign interest and inflation rates directly influence the extent of demand for foreign currency. Woo (1984) also contributed to the arguments by outlining four directions through which domestic inflation is being influenced by foreign exchange rate. He stressed that prices of international goods influence consumer price index directly, and cost of local goods. Current account has been adjudged to have direct link with the exchange rate fluctuations thus total demand and its changes are seriously affected, and finally, the impact of international goods on increasing prices were also pointed out by Woo (1984). Agenor and Montiel (1996) wrote that the phenomenon behind the construct that connect foreign currency and inflation rate is explained through the extensive research of the scholars to identify desires for imported intermediate goods used in local production that ultimately fuelled the cost of producing local goods and further spurred the amount paid by final consumers. Meanwhile, this is not related 100 percent, sometimes the objectives of government to make funds available to people trigger quantity of funds outside and within the banking sector and forced unnecessary demand for unwanted goods and excessive demand for the necessary goods. Indirectly, this situation proportionately increased exchange rate. In a word, Monfared and Akin (2017) applied the fixed

oil prices to where exchange rate can effectively result to hyper-inflation in a country. In contrary, if revenue gained from oil products declined, depreciation will be the outcome rather than inflation as assumed by others.

ii. The Balance of Payment (BOP) Theory

The BOP theory, also known as balance of international payment approach and constructed by Harry Johnson in 1977. The theory postulates that the exchange rate of a country's currency in relation with others is influenced by autonomous factors of domestic price and money supply. It states that foreign exchange rate is determined in a significant way, by the position of a country's Balance of Payment (BOP). The deficit BOP of a country signals a situation where demand for foreign currencies is greater than its supply. This is attributed to higher demand for foreign commodities, factors and services by the home country which was not complemented by the supply to the foreign countries. Thus, excess demand for foreign currencies is coincidental to the deficit BOP. The pressure results in the appreciation of foreign currency value as against the domestic currency. This implies that domestic currency depreciates while foreign currency appreciates and vice versa (Aahana, 2021). The exchange rate equilibrium is derived when a country achieved neither a surplus BOP nor deficit. The equilibrium rate of exchange can further be explained using the figure below:

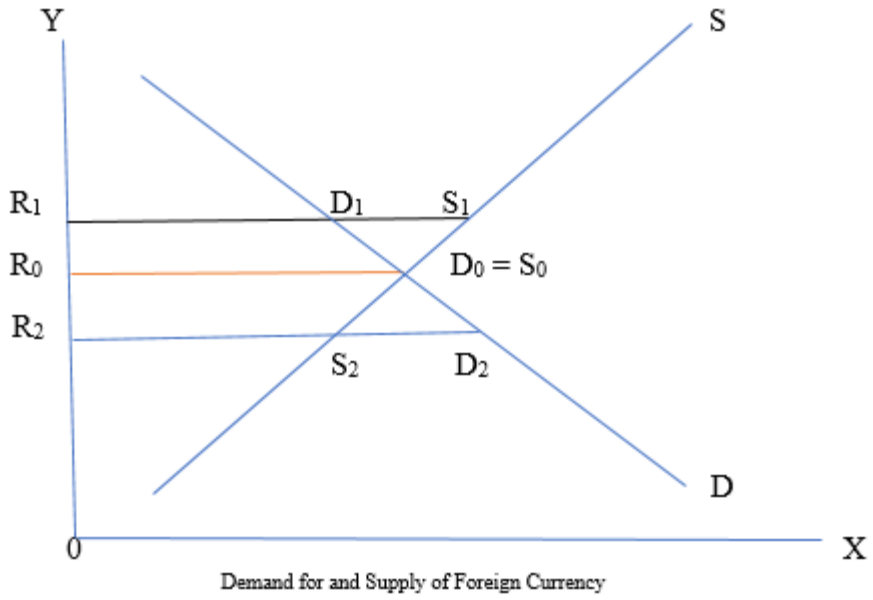


Fig. 2.3: Equilibrium Exchange Rate
Source: Aahana 2021

In figure 2.3, the demand for and supply of foreign currency are measured along with the rate of exchange of currency. The demand for foreign currency shows a downward slope as denoted by D while supply indicates an upward slope (represented by S). The rate of exchange equilibrium is denoted by OR_0 as shown in the figure. This can be explained as the intersection between the demand and supply of currency where $S_0R_0 = D_0R_0$. Hence, a scenario where a demand and supply of global currency equates each other is termed as BOP equilibrium of the home country. Where the currency rate is OR_1 which exceeds the equilibrium level of OR_0, the demand for currency D_1R_1 falls short of its supply S_1R_1. The scenario is referred to as surplus BOP. This means that excess supply of currency to the market reduces the value of foreign currency in relation to the domestic currency, hence the home currency appreciates. However, if currency rate OR_2 falls below the equilibrium rate of OR_0, the demand for currency D_2R_2 is greater than its supply of S_2R_2, thereby resulting in deficit BOP of the home country.

Consequently, domestic currency depreciates while foreign currency appreciates. If the demand or supply or both changes, the exchange rate will be affected accordingly. Aside from this factor, foreign exchange rate can also be influenced by local elasticity of imports and exports demand, as well as foreign elasticity of demand for exports and imports. Thus, to achieve stability in exchange rate equilibrium, it is necessary to attain high demand elasticity and low supply elasticity.

Despite the effectiveness of this theory, there are various market imperfections on the account of exchange and trade restrictions imposed by different nations which render the theory unrealistic. The assumption of BOP theory indicates no causal relationship between internal price level and the rate of exchange, hence resulting in false assumptions. The variability in the domestic price level often influences the position of balance of payments situation which may in turn affect foreign exchange rate. Furthermore, the theory is considered as just altruism because if it is assumed that BOP must be in equilibrium state, the possibility of exchange rate changes will be completely ruled out (Aahana, 2021).

iii. Monetary Approach to Exchange Rate

Compared to BOP theory of foreign exchange, this theory postulates that the demand for currency (money) depends on the level of real income, general price level and interest rate (Frenkel, 1976). This implies that demand for money has direct relationship with real income and price level. However, it shows adverse connection with interest rate (Aahana, 2021). In lieu of this, money supply is directly influenced by the monetary authorities of different countries of the world. Initially, it was assumed that foreign exchange market is in the state of equilibrium or interest parity and the policy maker or monetary authorities increase money supply in the home country, thereby leading to a proportionate surge in the general price level over a long period. This, in

effect, results in currency depreciation as postulated by the PPP theory. For instance, if the Central Bank of Nigeria (CBN) increases the stock of supply by 20%, it may lead to the same 20% surge in general prices. This implies 20% depreciation of naira in relation to, say, pound sterling, over a long period while the interest rate given for money demand is likely to decline. Hence, the expansion of money stock and declined interest rate will instantly affect exchange rate and financial markets of the home country.

It is noteworthy that monetary approach to exchange rate relied heavily on PPP approach. Hence, the upsurge in Nigeria's money stock signifies lower interest rate and its influence on foreign exchange rate is determined through changes in real income. Furthermore, it can also be assumed that exchange rate adjusted to money markets without corresponding changes in reserves and the exchange rate is influenced by the level of inflation rate in each country. However, the major criticism of the theory or approach is its failure to explain the movement of currency rate of major currencies during flexible exchange rate since 1973. Similarly, the monetary approach laid more emphasis on money and its roles without considering trade as the crucial factor influencing exchange rate. Furthermore, the theory has not been proven empirically to be significant and the models failed in their ability to forecast (Aahana, 2021).

2.6 Theories of Inflation

2.6.1 Keynesian Theories of Inflation

There are two broad theories of Keynesian's inflation that are discernible. Both the non-competitive and quasi-competitive Keynesian theories of inflation fall under this category. Yet, the Keynesian's arrow of causality shifts from right to left in the exchange equation.

i. The Quasi-Competitive Theory of Inflation

James Tobin, Mancur Olson, James Meade, and David Colander are among the prominent proponents of this viewpoint. It asserts that fundamental flaws present in a monetary economy cause upward pressure on general price at the point of competitive equilibrium. Because suppliers would seek rents by setting up institutions that will set rules against potential suppliers eager to enter the market, it is implied that market perfect competition is unstable. These actions are referred to as the "invisible foot," which increased pressure on the pricing level. The theory is further discussed in the figure 2.4 below

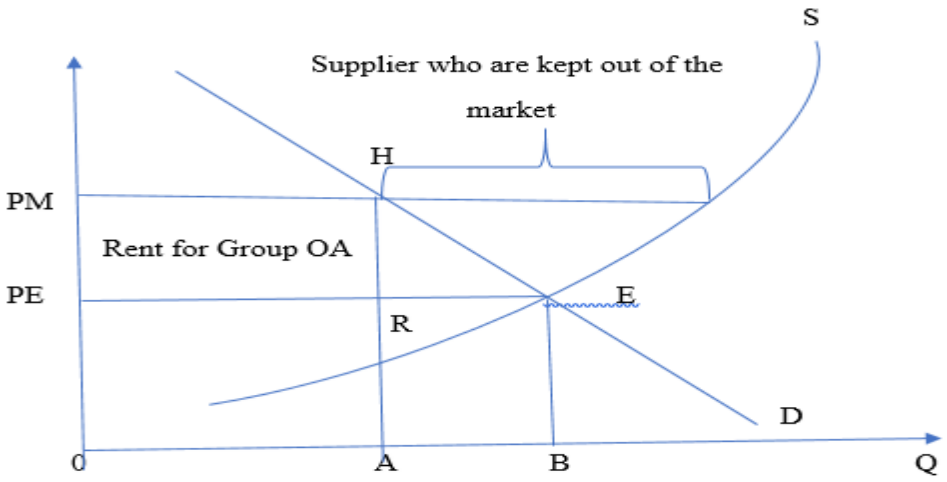


Fig. 2.4: Forces of Monopolization: The Quasi-Competitive Theory of Inflation
Source: Anyanwu 1995

The figure 2.4 indicates where the demand/supply equilibrium price is $P_{E.}$ When facing such competition, individuals would have a strong incentive to escape the competition by joining with other individuals to monopolize the price of goods (i.e. setting higher price for goods). If the suppliers of quantity OA merge together and guide against other suppliers of quantity AB from entering the market, their profit/income will increase by the quantity represented by the P_E $RHP_{M.}$ Thus, they are willing to spend up to that amount to kick against competition to bring the price down. As they spend money to create the necessary constraints/barriers for supplier to enter the market that will hinder their plans for higher prices, they create a rising pressure on the price in the market too.

ii. The Non-Competitive Keynesian Theory of Inflation

The postulation of this theory hinged on the competition in the market. It was presumed that competition in the market is weak and no reason to give full attention to competitive market rather one should consider world market at large and arrangement made by the institution to specifically manage a particular market. Hence, the first variation of these theories emphasizes on exact identified market and the problem of inflation, while focusing on the institutional arrangement in that specific market.

Cost-Push Theory – According to this view, monopolies on the market place and the monopolist's profit is what really trigger inflation. The emphasis on the product market was eventually dropped, however, as another economist explains that it is currently trendy to pay attention to the labour force and wage-push inflation.

Wage-Push Theory – The most widely circulated Keynesian theory is this? Most of the time, market forces are essentially non-existent and societal factors influence pay levels. For instance, Peter Wiles's theory of inflation centered on wage inflation and It asserts that wage inflation is largely unaffected by economic factors and is instead determined by the discretion of union officials. Therefore, if union leaders decided unreasonably, money wages increase and that surge is passed on through firms' markup pricing techniques, thereby leading to price inflation. Sidney Weintraub's wage cost markup theory also corroborates that once nominal wage and price level rises, government has two options: it is either to ratify the increase, thereby causing inflation; or to refuse ratification, leading to unemployment.

Hence, the second variant of these theories include 'Leap-Frogging Model' which centered on normal wages differential or wage contours known as 'Wage Contour Theories'. These theories were advocated by Michael Pigore, John Hicks, and others. The supporters held that if wage disparities were disturbed for whichever reason, inflationary pressure would be created, and it would once again be up to the government to either support or oppose. Because of the effect of salaries, there are a large number of stable relationships between the wage rates of particular classes of jobs and workers. These connections are known as wage contours. The borders of the economy's more or less self-contained outlines change throughout time as their relationships do. When a wage relationship breaks, distorting one of the continuous interactions, there is tremendous pressure to fix it. These pressures come directly from the employees themselves and manifest as demonstrations and industrial action. As a consequence, the condition results in disputes on an organizational and policy level between various branches and divisions of organizations like enterprises and unions. It was often thought that inflation occurs in two stages and is brought on

by outside shocks that cause a stable wage contour to sag. Then, organizations and people will act to bring back the previous disparities.

The majority of genuine inflation is produced by the restoration procedure. Leap-frogging theories, on the other hand, view class and sociological characteristics as being more important than economic variables for determining relative salaries because the beginning determinants are the strategic elements. After repeated leapfrogging pay rises, new acceptable contours are obtained because wage contours eventually change. Thus, wage contour theories are short-run theories and thus become long run theories when it is embedded with the assumption that price shocks and attacks on the wage contour are continuous. The accommodation of supply shocks results in increased inflation but reduces unemployment rate. That is, when governments accommodate supply shock, they tend to increase the money stock to prevent unemployment that might occur due to supply disturbance that moves the short run Phillips curve.

iii. The Monetarist Theory of Inflation

Perspective of Monetarist is that causation arrow in the equation is going from left to right, that is, an upward trend in quantity of money will bring about an increase in price level. This theory is a competitive model that relates inflation to the growth of stock of money or money supply.

The theory assumes that a change in the velocity V is majorly determined institutionally as is the growth in Q (real output). Thus, monetarists believe that these two variables are exogenous, leaving inflation to be influenced by the change in money stock in excess of changes in velocity(V) deducted by changes in real growth. Inflation can occur only if the supply of money continues to increase, since it is the continual change in prices. Thus, it is believed that it can only be a lasting, predictable and controllable source of inflation as the monetary growth. To the monetarist, the

arguments for increasing the money supply are short run while their own arguments against are long run. In view of this, government policies will continue to increase the volume of money supply to higher levels, even if they are fully aware of the long run inflationary effect.

2.7 Exchange Rate and Inflation: Theoretical Link

The amount of home currency used to buy foreign currency is referred to as exchange rate. This rate could be fixed or floating; where the decision rests squarely on the monetary authority. In a case where foreign currency becomes too expensive, it corresponds to a weakening local currency. However, if the currency of foreign countries drops, it corresponds to value gained by the local currency. The higher rate of real exchange means that foreign commodities will be more expensive in relation to domestic products. Thus, both foreigners and local residents tend to make upward review of the commodity prices to meet up with their cost incurred. Humphrey and Thomas (1977) explain that one of the best approaches to exchange rate is the monetary model, especially when an economy is operating floating regimes. This approach is more populated in the literature around 1970s, it explains that the rate of exchange is conditioned on aggregate money demand in a given country and supplies which has greater influence on price levels.

The major assumptions of monetary approach hinged on: first, the demand for money, which has a direct link with the rate of interest and real income. Relative to this economic thinking and phenomenon, several empirical studies were conducted to determine the veracity of this argument. Regrettably, one cannot deduce a concrete conclusion as many studies provided different outcomes (Nimoh, Addai-Asante & Obeng, 2017). Second, the theory assumes non-existence of blocs between trading partners of other countries. This condescend that there should be free trade among countries without creating unnecessary barriers. This was upheld to promote law of one price

among countries. The approach claimed that the excess money stock may create foreign capital outflows in an economy, and if foreign exchange rates are floating, it can lead to diminish in the value of domestic currency. Thus, factor causing excess money demand can lead to currency appreciation. Thus, the exchange rate determination moves in the same proportion of the factors influencing excess demand (or excess supply) for money in an economy. Therefore, it could be agreed upon that factors that are responsible for changes in foreign exchange can be subjected to the factors that led to excess money in the circulation.

Considering the determinants of inflation, the monetarist explained the existence of money supply-prices nexus. They argued for policies aimed to curb money stock whether in foreign or domestic terms. The structuralist also lingers on the structural factors such as cost aspect, while agreed on the expansion policy response to crises. However, fiscal approach through fixing fiscal deficit issues was equally found to be relevant in the inflation determinants model across the face of literature. Thus, the argument about the factors affecting inflation is usually between the structuralist and the monetarist.

The link between exchange rates and prices are categorized into two main channels, including indirect and direct channels (Hendry, 1986). Direct channel is related with the concept of law of one price which states that, “the changes in foreign exchange rate for foreign goods have direct influence on local prices while the indirect medium is expressed as total demand medium”. An upsurge in exchange rate could make local goods cheaper for foreign consumers, thereby resulting in increased exports, prices and demands. A surge in foreign exchange price increases inflation rate. Similarly, the upsurge in price of foreign product will automatically increase the cost of

production and inflation in the country since these commodities are consumption and intermediate goods (Agenor& Montiel, 1996).

2.8 Empirical Review

Several studies have been conducted on the interaction between exchange rate fluctuation and inflation rate in different countries of the world. Some studies found positive relationship between the variables while others revealed negative. Hence, the following researches were reviewed in this section.

A review of literature and empirical evidences on the factors causing inflation rate have produced three schools of thoughts, such as monetarist views, fiscal imbalance perspective and the structuralist views (Mishkin,2004; Taslim, 1982; Akinbobola,2012; Chaudhry, Farooq & Murtaza, 2015; Chowdhury, Dao & Wahid, 1995). To this very end, monetarist's factor, such as the level of stock of money in the circulation and fiscal imbalance such as government spending to finance budget deficit to cushion the effect of recession has received considerable debate in the literature. However, the structuralists' argument for the influence of cost of production has received little attention from the literature.

Amir, Azam, Syed and Huda, (2012), emphasized that exchange rate is an imperative factor in the determination of the level of inflation across the world. McCarthy (2011); Claudia (2014); Liao, Wang and, Gao (2019) stressed that exchange rate depreciation can effectively boost the terms of trade and improve exports but may cause an upsurge in price level and fetch imported inflation into the country. Canetti and Greene (1991), argued that the growth in money supply and exchange rate adjustments cause high inflation rate. The key reason for this is that inflation in Africa is not the result of overheating but cost-push because of higher global prices for intermediate and some

consumable goods resulting in imported inflation. Adeoye and Atanda (2011), opined that the instability and frequent exchange rate fluctuation could be attributed to flexible exchange rate regime in developing countries with deficit trade pattern and unstable macroeconomic environment. This means that exchange rate fluctuations bring unwarranted changes to trade balance and thereby cause high inflation due to high import rate (Carrera, & Vuletin, 2003; Kandil 2004, Koll Mann, 2005; Abbas, Iqbal & Ayaz, 2012). As a result of this unfriendly situation, the monetary authorities are expected to apply appropriate policy to contain skyrocketing inflation rate in West African countries. However, IMF (2021) stated that fourteen West African Countries in the two CFA francs are shielded from imported inflation due to the euro peg exchange rate regimes practiced and euro performing better than dollar.

Georgiadis, Gräb, and Khalil, (2017) posited that exchange rate depreciation is to blame for the link between exchange rate and inflation rate. Relationship between exchange rate and inflation rate is attributed to the exchange rate depreciation. It was claimed that higher domestic import costs are anticipated as a result of depreciation, which entails a decrease in the effective exchange rate. Depending on a variety of variables, higher consumer prices may or may not constitute a positive pass-through. Fischer (2015); Forbes, Hjortsoe, and Nenova (2017); Mishkin (2008), argued that the important forces behind high inflation rate is exchange rate fluctuation which further poses a significant impact on the monetary policy formulation. It was assumed that the anticipated implication of currency movements on price level usually determine the response of central bank and monetary authorities to it. It has been submitted in the literature that monetary transmission mechanism could be adopted to stabilize inflation rate or application of inflation targeting policy. Recent evidence shows that Zimbabwe is topping the list of inflation threatening countries with 194%, followed by Sudan, South Sudan and Angola with 163.26%, 46% and 22.2%

inflation rate respectively. For instance, the Central Bank of Nigeria has only considered and focuses on economic growth despite the hike inflation in the country compared with other developing countries adopting inflation targeting policy that directly reduces inflation. Similarly, tight fiscal policy has been argued to be a better instrument to fight inflation. However, the application of this policy has failed to reduce inflation in a country like Botswana and Nigeria; rather, the annual inflation rate has continued to increase sporadically. Although, it was revealed in the report of IMF (2021) that the rate of inflation rate in African nations is attributed to cost push as a result of exchange rate fluctuation of monetary policy approach to manage exchange rate in the country.

The study by Delatte and Villavicencio, (2012), and Kelikume (2018) carried out in the developed countries generally associated the high inflation rate to the cyclical changes in global economy, sharp movements in oil prices, rising wages, government spending, budget deficit, high rapid growth, money supply, population and exchange rate shocks. Also, the study by Khan, (1989), Calvo and Reinhart, (2002), and Rogoff, (2003), conducted in developed nations; attributed the global inflation to instability in monetary frameworks, globalization and high level of exchange rate fluctuations. Naghdi and Kaghazian, (2015), emphasized that due to high dependence on importation of production materials, intermediate goods and capital equipment, exchange rate affects the rate of inflation in the developing countries.

A good number of studies on the subject matter have empirically considered various factors to establish the relationship between inflationary pressures and the contribution of exchange rate under different conditions and sizes of the economy. The study by Delatte and Villavicencio (2012) and Kelikume (2018) carried out in the developed countries generally associated the high inflation

rate to the cyclical changes in global economy, sharp movements in oil prices, rising wages, government spending, budget deficit, high rapid growth, money supply, population and exchange rate shocks. Also, the study by Khan (1989), Calvo and Reinhart (2002) and Rogoff (2003) conducted in developed nations; attributed the global inflation to instability in monetary frameworks, globalization and high level of exchange rate fluctuations. Naghdi and Kaghazian (2015) emphasized that due to high dependence on importation of production materials, intermediate goods and capital equipment by developing countries, the value of exchange rate affects the rate of inflation in the developing countries.

Given the extent of globalization, it has been observed that monetary policy measures in developed nations have influence on the policy options and performance of major macroeconomic indicators in emerging and developing nations (Sanchez, 2013). In 2020, African Development Bank (AFDB) reported that the expansionary fiscal policy implemented to solve the problem of budget deficits in West African countries except for Togo and Cape Verde, contributed to the increase in average inflation rate in the region. This economic fact has been subjected to critical empirical investigation in the literature without a specific consensus. This study is not the first to investigate the factors influencing spiral inflation rate, some scholarly studies did this but did not consider excessive taxation on goods and services which is one aspect of fiscal policy, rather those studies focused more on money supply as an aspect of monetary policies to be the major factor causing persistence increase in inflation.

On the contrary, Chuba (2015) concluded that the persistent increase in inflation rate could not be significantly explained by the exchange rate fluctuation, but it was confirmed that the relationship between the two important variables is positive. It was stated that external shocks do not literally

influence inflation but the increase in the consumer price index is mainly affected through its own shocks and subsequent spike in money supply in the circulation. The argument in the previous studies that weaker currency spurs export in developing countries is assumed in this study to be counterproductive. This lends credence to the existing school of thoughts that exchange rate fluctuation is detrimental to import dependent countries and distort their domestic prices at the expense of other macroeconomic problems.

In the literature, there are different analytical techniques used by the previous studies ranging from Ordinary Least Square (OLS) to Autoregressive Distributed Lag (ARDL). The research carried out by Joof and Jallow (2020), Jibrin and Jelilov (2017), Mogaji (2017), and Onuoha (2014) employed Ordinary Least Square (OLS) technique to present their findings and conclusions. This method is Best Linear Unbiased Estimator (BLUE) which is a strong analytical technique that provides answers to complex research questions. Regression models are very easy to comprehend as they are based on statistical principles such as correlation and least square errors. However, the main weakness of OLS is that the technique is susceptible to co-linear problems and sometimes the way it measures errors is not justified (Clockbackward, 2009). Similarly, Musa (2021), Nathaniel, Oladiran and Oladiran (2019) as well as Sibanda (2012) used Co-integration and Vector Error Correction Model (VECM) to determine the nexus between exchange rate and inflation. The VECM is a suitable technique for co-integrated data series. It is important when long run estimate is desired, as Vector Auto Regression (VAR) does not explicitly consider the long interaction (Chamalwa & Bakari, 2016). VECM also deals with both stationary and non-stationary variables with variant orders of integration. However, the problem of over-parameterization often occurs in complex models such as VECM analysis (Hapsari, Astutik & Shoehorn, 2020).

Above all, the study of Revelli, (2020), Prow (2020), Nimoh, Addai-Asante and Obeng (2017) as well as Nchor and Darkwah (2015) adopted Autoregressive Distributed Lag (ARDL) as their analytical techniques. ARDL is useful for small sample size and provides results for individual country and specific policy implication. Hence, this study intends to fill the gaps in the literature by adopting Non-Linear Autoregressive Distributed Lag (NARDL). This technique does not necessarily require the variables considered to be integrated in the similar direction and it captures the asymmetric relationship among the variables of study (Gbosi, 2017).

The research conducted by Philips, Akinseye and Oduyemi (2022) on whether exchange rate and inflation determine the changes that occur in stock returns and oil price. They adopted asymmetry and non-linear techniques to the data gathered for the study. It was shown by the techniques that the influence of inflation on stock returns and oil prices is grossly insignificant. Surprisingly, the influence of exchange rate was significant to explain the changes in stock returns and oil cyclicality. In addition, the study by Geyik, Demir and Erdoğdu, (2022) took a different dimension to look at the connection that links major variables like interest rate inflation rate, and exchange rate.

The study intended to generalize the results and considered BRICS countries for the estimation. In the study, monthly data from 1996 to 2021 were preferred. However, negative result was found among Brazil, China, and South Africa and positive between Russia and Türkiye. Ashok and Boopen (2022) look into the pass-through of exchange rate to inflation from 1980 to 2016. With the use of ECM and Regression, it was discovered that ERPT truly pass through to inflation but a weak and low pass through. The result further indicated nonexistence of the association between the said variables in the long period of time but realized that speed of convergence among the variables was very high but takes 2years before convergence. The work of Sadikin and Lutfi

(2022) linked the role of stock market in the relationship between exchange rate and inflation. It was further looked into the response of stock market index to changes in both inflation and exchange rate using linear regression method for the estimation. It was discovered that stock market index responds significantly to inflation and exchange rate but negatively to exchange rate.

Olamide, Ogujiuba and Maredza (2022) carried out investigation in Southern African Development Community (SADC) to reveal the relationship connecting inflation, exchange rate and economic growth complementarity and substitutability. PMG, DFE, GMM were employed to estimate data from 2000 to 2018. The technique revealed that exchange rate adversely compliments the effect of economic growth on inflation in SADC. The volatility generated through GARCH model indicated a negative influence on economic growth. This instability in exchange rate further pushes economic growth to fuel inflation rate in the region. The study confirms that the volatility in exchange rate worst off the interaction between inflation and economic growth. It is understood that exchange rate pass through will be accelerated if inflation rate skyrocketed.

Akbar (2021) investigated the link factors leading to inflationary pressure and attributed money stock, exchange rate and other variables. The study was based on data between 1976 and 2017. Bayesian model was constructed and estimated to analyze the data gathered. The result demonstrated that the magnitude at which exchange rate influence inflation negatively when the value is appreciated. Also, exchange rate instability linked to money supply negatively within the period under review. Additional information provided in the study is that inflation improbability affects share prices and money demand. The research work conducted by Deka, Cavusoglu and Dugbe (2021) looked at the influence of renewable energy in the rate of exchange -inflation relationship. They considered Brazil as the case study and data were sourced from World Bank. The researcher relied on ARDL to measure both short and long run and considered ECM to

measure speed of convergence. The estimation shows that exchange rate causes inflation pressure. Also, inflation equally caused exchange rate instability in Brazil. There was existence of long run relationship but rate of convergence in the short run disequilibrium takes long time before adjustment over the long period. Among the outcomes, it was shown that emergence of renewable energy in Brazil helps to boost their currency value in the recent time. Aklin, Arias and Gray (2020) investigated the veracity of exchange rate on inflation. It was discovered that inflation worsens the welfare of a nation and pose great implication on individuals. It was revealed from the review that people are more concerned about inflation trends in the economy when there is fixed exchange rate system practiced. It was revealed that debt servicing, savings rate are major factors contributing to inflation in middle income countries like Argentina and Serbia; and developed countries like United Kingdom and United States of America.

2.8.1 Evidence from Developing Countries

From 2015to 2018, Suhadak and Suciany (2020) assessed the response of stock market to changes in exchange rate and inflation rate in Indonesia. The study used secondary data which was culled from Indonesia Stock Exchange Market and Bank of Indonesia. The findings show positive and insignificant influence. However, the price of stock responded negatively to changes in interest rate or cost of funds.

In Afghanistan, evaluation of possible effect of exchange rate pass-through on CPI inflation by Safi and Mashal (2020) was carried out using Pair-wise Granger Causality tests. The results showed high correlation between exchange rate and inflation. The correlation between these variables indicated 73.79 percent. Based on the regression results, exchange rate was discovered

to significantly influence inflation variable with a 0.44unit. This test also proved that exchange rate granger-caused inflation in Afghanistan unilaterally.

Vietha (2019) employed VAR model to determine the correlation between exchange rate and inflation rate and its influence on stock markets from 2004 to 2017. From the study, it was drawn that exchange rate inversely inhibiting stock market to diminish in value

Fahlevi (2019) used monthly data between 2013 and 2017 to look into the interaction linking inflation rate, interest rate, and exchange rate, as well as Indonesia's stock prices. The study employed regression analysis via SPSS to explain the association between the variables of study. It was established that there exists a positive interaction between inflation rate, exchange rate, interest rate and stock prices for the period under study. However, the major weakness of this study is the weakness of the instrument and technique of analysis. In Egypt, the exchange rate pass-through to inflation was carried out by Helmy, Fayed and Hussien (2018) using a structural VAR approach. Monthly data on producer price index, exchange rate, and consumer price index (CPI) between 2003 and 2015 was considered in the study. It was observed that CPI in Egypt is manipulated by the authority.

The study of Narayan and Sahminan (2018) covers the period of 1990-2017 to assess the connection between financial technology, exchange rate and inflation rate in Indonesia using descriptive analysis and Schwarz and Hannah techniques. The study covers some variables like exchange rate, unemployment rate, inflation rate, import price index, oil price and fin Tech data from Fin Tech Indonesia. It was observed that Fin Tech minimizes inflation and contributes to the appreciation of the exchange rate (rupiah) against the US dollar, though its impact on the rate of exchange is usually delayed.

Fetai, Koku, Caushi and Fetai (2017) captured Western Balkan countries and considered different exchange rate regimes to analyze the affiliation connecting exchange rates and inflation. These regimes depend on the benefits and costs in giving up an exchange rate instruments. The findings show that exchange rate has a direct linkage with inflation in Western Balkan countries. Thus, it was recommended that governments should consider the relative costs and benefits required for the introduction of a floating exchange rate in open economies due to such regime that is most likely to suffer more costs than gains.

Abdurehman and Hacilar (2016) used ARCH and GARCH model to probe the connection involving exchange rate and inflation in Turkey. Unlike previous studies, this study employed data on inflation from Turkey and United Kingdom for comparison to probe the connection. The results described that there is no existence of purchasing power parity in Turkey. On the contrary, the presence of ARCH and GARCH shows that the divergence of the variables follows similar pattern away from PPP assumptions and are not random. Thus, the study concluded that factors such as government restriction, transaction costs, product specialization among others contributed to the deviation of PPP. In Romania, Morosan and Zubas (2015) they used regression analysis to assess the interface among interest rate, exchange rate, and inflation rate over the period of 2005-2014. It was therefore concluded that high level of interaction exists between interest rate, exchange rate and inflation in Romania as presented by the regression results.

Within the period of 1980 to 2007, Madesha, Chidoko and Zivanomoyo (2013) employed granger causality test to explain the connection between exchange rate and inflation in Zimbabwe. The finding shows that exchange rate and inflation granger-cause each other for the period under study. Hence, it was suggested that appropriate and effective policies should be drawn considering how

foreign exchange carry out its roles without resulting in inflation and the policy makers should find means of minimizing the effect of inflation on the economic crises so that exchange rate fluctuation will not lead to inflation surge in the country.

The study carried out by Sibanda (2012) used quarterly data to evaluate the connection that linked real exchange rate and economic growth in South Africa between 1994 and 2010. The data were analyzed using Johansen co-integration methods and vector error correction model techniques. The techniques provided positive connection among the considerable variables in the study. Specifically, money supply as well as openness to trade change economic growth negatively in South Africa. Furthermore, it was discovered that devaluation of currency, in the long period negatively deterred economic growth but boosts economic growth in the short run significantly. As a result, it was recommended that currency misalignment should be guided against at all costs and monetary authority should adequately maintain stable interest rate in the country.

2.8.2 Evidence from West Africa

Ndiaye (2021), considered ECOWAS countries to evaluate the nexus connecting exchange rates and inflation rates. The study covers the period of 1980 to 2020. The outcome revealed that countries in WAMZ experienced exchange rate pass-through to inflation in comparison with other nearby countries. Succinctly, both output and money supply do not converge inflation rates in WAEMU and WAMZ countries through Inflation Differential Model (IDM). However, there are proves that inflation rates do not converge significantly with the regime of exchange rate.

The study conducted by Musa (2021) revealed that volatility in exchange rate on inflation in Nigeria between 1986 and 2019 is significant. The study considers variables such as CPI (proxy

for inflation), nominal exchange rate (NER), import, export, and money supply. Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Vector Error Correction Model (VECM) established the long-run interaction between exchange rate volatility and inflation. The bounds test of co-integration revealed that there is long-run connection between the variables. The study therefore suggested that monetary authority should formulate suitable policy to control inflation to the barest minimum.

Prow (2020) evaluated the major factors influencing inflation in Liberia using Autoregressive Distributed Approach (ARDL). The study covered the period spanning from 2014 to 2018. The results show that Liberian inflation is affected by unauthorized printing and infusion of new currency into the economy. Similarly, it was discovered that customs taxes, exchange rate depreciation, import and global prices of oil are the major determinants of inflation in Liberia. Thus, the study suggested demonetization of Liberian dollars (both old and new). This will provide the apex financial institution with reliable information of the total currency in circulation, thereby enabling the bank to promulgate contractionary monetary policies in order to drive the current rate of inflation to single digit. The study further suggested that the government should embark on policies diversification with emphasis on value added in agricultural and manufacturing production for local consumption.

The nexus connecting interest rate, inflation rate, and exchange rate in Nigeria has been examined by Inam and Isaac (2020) using Vector Autoregressive Co-integration technique of analysis. They covered the period of 2010-2018 and captured some variables such as money supply, inflation rate, interest rate, output growth and exchange rate. The findings show a long run interaction between the adopted variables. Joof and Jallow (2020) investigated the influence of interest rate and

inflation rate on exchange rate of Gambia from 2007 to 2018. The study employed Dynamic Ordinary Least Square (DOLS), Fully Modified Ordinary Least Square (FMOLS), as well as Canonical Co-Integration Regression (CCR). The results revealed positive correlation between inflation and exchange rate in the long run.

The research carried out by Nathaniel, Oladiran and Oladiran (2019) evaluate the relationship between exchange rate and economic integration in ECOWAS between 1980 and 2015 using secondary data. The data were culled from World Bank Development Indicator. The data captured transportation cost, trade openness, per capita income, common language, tariff, real gross domestic product and exchange rate. Panel analysis was carried out and it was discovered that a unit increase in exchange rate deepened economic integration by 0.13% in ECOWAS member countries. In conclusion, exchange rate regimes are very crucial in promoting integration among ECOWAS member countries.

Using Auto Regressive Distributed Lag (ARDL) estimate approaches, Nimoh, Addai-Asante, and Obeng (2017) assessed the interaction between exchange rate and Ghana's inflation. They discovered both a short and long period impact of cedi devaluations on the trend of inflation. Low speed of adjustment is evident in the ECM model for floating exchange rates as well. In other words, the result indicates that it will take over 2 years to restore the model's disequilibrium. The study made clear that any decrease in the value of the cedi through depreciation or devaluation had an inflationary effect because both types of devaluation –depreciation under a fixed rate system and depreciation under a floating rate, have a direct influence on raising the cost of production and the prices of locally produced goods. Hence, it was recommended that the government implement measures to help stabilize the cedi's value in relation to other currencies in order to increase public

trust in the cedi and restrain inflation. Due to this, initiatives designed to encourage foreign exchange inflows must be rigorously pursued.

Mogaji (2017) assessed the influence of relevant macroeconomic indicators on economic performances of the WAMZ countries. The study considered many countries like Ghana, Nigeria, Gambia, Liberia, Sierra Leone and Guinea. Relevant data were collated from various sources covering the period of 1980 to 2014. ANOVA test was adopted and it was established that all the development indicators investigated, posed different effects in the WAMZ countries. In terms of the entire WAMZ, Ghana has similar feature in the aggregate economy of WAMZ when Nigeria was excluded in the analysis. However, only Nigeria extremely shares same attributes with the whole WAMZ when the six WAMZ countries were consolidated.

Monfared and Akin (2017) used the Vector Auto Regression (VAR) model and the Henry General to Specific Modeling Approach to investigate how the currency value affects inflation. The research considers annual data from 1976 to 2012. The findings indicate that a country's inflation rate is influenced by its exchange rate with other nations. The research additionally discovered that inflation is favorably influenced by both the monetary base and the currency exchange. But, compared to the rate of exchange, monetary base has a greater influence on inflation.

Jibrin and Jelilov (2017) assessed the significant response of economic growth to ECOWAS countries with exchange rate policy from 1990 to 2014. The variables considered for this study include real GDP, exchange rate, interest rate, and inflation rate. The samples of 10 countries were considered. It was revealed that economic growth significantly responds to exchange rate in 4 countries and statistically significant in three (3) countries to inflation rate.

Bada et al, (2016) used quarterly data to investigate the implication of foreign exchange on aggregate imports and consumer prices in Nigeria, 1995 to 2015. The co-integration analysis and vector error correction model was used to analyze the data collected. The results show an incomplete effect of exchange rate on Nigeria's inflation and the long run pass-through elasticity were discovered. The effect on import was found to exceed that of consumer prices. In conclusion, the outcome of the study is found to be relevant in designing and implementing policy related to management of Nigeria's exchange rate.

Nchor and Darkwah (2015) evaluated the connection between inflation, interest rate and exchange rate in Ghana using ARDL model. They also employed OLS regression to determine the existence of Fischer Effect and International Fischer Effect. It was found that 1% increase in Ghana cedis depreciation will lead to 0.20% increase in inflation in the short run. However, a surge in nominal interest rate reduces inflation by 0.98%. In the long run, inflation rises by 1.33% as nominal interest rate increased by 1%. On the other hand, a surge in inflation results in an increase in nominal interest rate by 0.51% which connotes the partial Fischer effect. Furthermore, a percentage increase in the rate of interest differential leads to cedis depreciation by 1% which explained the full International Fischer effect.

Onuoha (2014) used ordinary least square techniques to investigate exchange rate variation and inflation on economic growth in Nigeria over the period of 1980-2010. The data such as import exchange rate, inflation rate, export and gross domestic product were collated from Central Bank of Nigeria (CBN) statistical bulletin. The study found that both import and export have positive interaction but statistically insignificant. However, exchange rate shows positive connection and statistically significant at 3.4%. This implies that positive interaction exists between exchange rate

and inflation. However, economic growth shows negative relationship, thus, the study concluded that inflation and unstable exchange rates negatively influence economic growth, moderate inflation rate supplements return on saving, boosts investment and in turn leads to a nation's economic growth. The study therefore suggested that government should not use over-reliance on macroeconomic policies as a means of fighting inflation alone but should also concentrate on other aspects of development such as factor input and development of human capital.

The study of Ebiringa and Anyaogu (2014) used ARDL co-integration analysis to establish a long run interaction between exchange rate, interest rate, and inflation covering the period of 1971 to 2010. The results revealed that exchange rate and inflation are positively and significantly related in both short and long periods. However, interest rate exhibits a negative relationship and statistically insignificant. The study therefore suggested that government should double their efforts to ensure that there is stable periodic inflation in order to achieve stable exchange rate regime.

2.9 Gaps in the literature

Several literatures were reviewed to outline and identify the existing gap to give reasons for carrying out this research work. The question of what is missing in the policy implication and why inflation in some countries could be more sensitive to the fluctuations in exchange rate than others still remain questions to be answered in the literature. The research gap addressed by this research is to identify the main drivers of inflation rate in West African countries and policies that kept inflation at bay in developed nations. The majority of economic research holds that the capital stock, price levels, economic output, rate of interest, output, and other relevant economic variables determine exchange rates. For the examination of exchange rates, several quantitative models that take these economic factors into account have been presented (Frankel & Rose, 2000; Lyons, 2001).

However, the problem with these existing studies is that they failed to consider some country's structures which are major factors that can influence exchange rate fluctuations. Such macroeconomic factors are monetary and fiscal policies. Though there are studies which have considered environmental factors, institutional quality, macroeconomic factors, monetary and fiscal policies, their focal points were on developed and emerging economies. As far as this empirical review is concerned, there are still scanty studies in West African countries in relation to exchange rate fluctuation and inflation rate.

Furthermore, there is an existing argument in the literature that any shock to the system, whether economic, financial, or commodity, will affect the interaction between the exchange rate and inflation rate. Pham (2019) argued that the response of inflation to exchange rate differs in relation to the period of shocks. It was stated that a negative (appreciation) shock to the system in one

month, six months, twelve months and fifteen months will reduce inflation rate by 5%, 13%, 22% and 24 respectively.

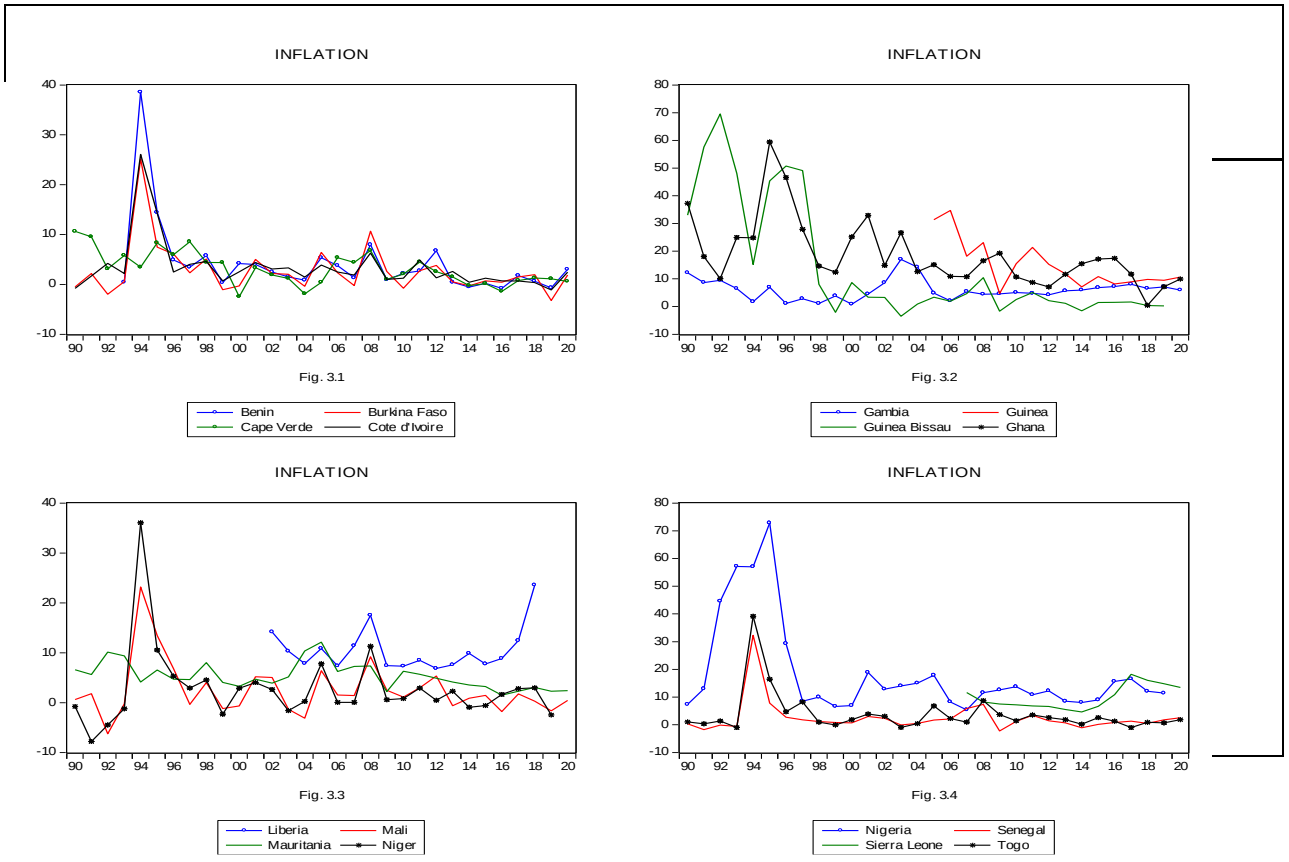
2.10 Trends Analysis

2.10.1 Trends of Inflation Rate of West African Countries

The study covered fifteen (15) West African countries. It showed the trends of data such as real exchange rate, official exchange rate and inflation rate across 15 countries from 1990 to 2020. However, the trends of these variables were explained and divided into three categories. Majority of the West African countries are among the developing countries in the World with minimal inflation rate as shown below. For instance, in Benin Republic, the highest inflation rate as at 1994 was estimated at 38.5%. Since then, inflation has dropped drastically showing a negative record in 2014, 2016, and 2019 at -0.55%, -0.79% and -0.71% respectively.

Similarly, Burkina Faso experienced high inflation rate of 25.2% in 1994 and subsequently dropped to a record of negative on several years. In Cape Verde, the highest record of inflation was seen in 1990 at 10.6% and Cote d'Ivoire also witnessed high inflation rate of 26.1% in 1994. In Gambia, the highest inflation rate as recorded between 1990 and 2020 was 17% and this was found in 2003 while Ghana had a record of 59% in 1995. Since then, the government of Ghana has formulated series of policies to regulate the economy and control inflation. Part of these policies is the adoption of 'Inflation Targeting' monetary policy framework. As a result, Ghana has been maintaining single digit inflation rate estimated at about 7.1% in 2019 and 9.9% in 2020. In Guinea, there was no record of inflation between 1990 and 2004, however the highest inflation rate in 2006 was estimated at 34.6% and subsequently fell to 10.6% in 2020. Guinea Bissau recorded high inflation rate in 1992 at 69.5% and later dropped drastically to 0.24% in 2019. As

reported by World Bank, Liberia had no record of inflation between 1990 and 2001, but the highest inflation rate was seen in 2018 at 23.5%. Mali reported high inflation rate of 23.2% in 1994 while Mauritania showed a record of high inflation in 2005 at 12.12%. In Sierra Leone, there was no record of inflation between 1990 and 2006; Nigeria recorded high inflation rate in 1995 at 72.8%, Niger (36.04%) in 1994; Senegal (32.3%) in 1994 and 39.16% was reported in 1994 as the highest inflation rate in Togo. Other flows of inflation in each West African country are shown in the graphs below.



2.10.2 Trends of Official Exchange Rate in West African Countries

The facts about the official rate of exchange in West African countries were explained according to individual country's currency rate in relation to US dollars. For instance, the name and value of currency in each country differs. In Benin, the currency name is called CFA franc and as at 2020, 574.2945 equivalent to one US dollar. In 1992, Benin experienced currency appreciation with an estimation of 264.6918 to $1, since then the currency has not been stable showing a period of depreciation when compared to 1992. Cote d'Ivoire, Burkina Faso, Niger, Guinea Bissau, Mali, Togo and Senegal are using CFA franc as their currency showing a record of 575.586 in exchange for $1 in 2020. However, Cape Verde's currency is called Cape Verdean Escudo (CVE); Gambia (Gambian dalasi); Guinea (Guinean franc); Ghana (Ghanaian cedis); Liberia (Liberian dollar); Mauritania (Mauritanian ouguiya); Sierra Leone (Leone); and Naira is used in Nigeria. Among the West African countries' currencies, Ghanaian cedis is the most appreciated currency in relations to UD dollar estimated at 5.5957cedis to $1 in 2020. Every country's currency has some periods of appreciation and depreciation as shown below.

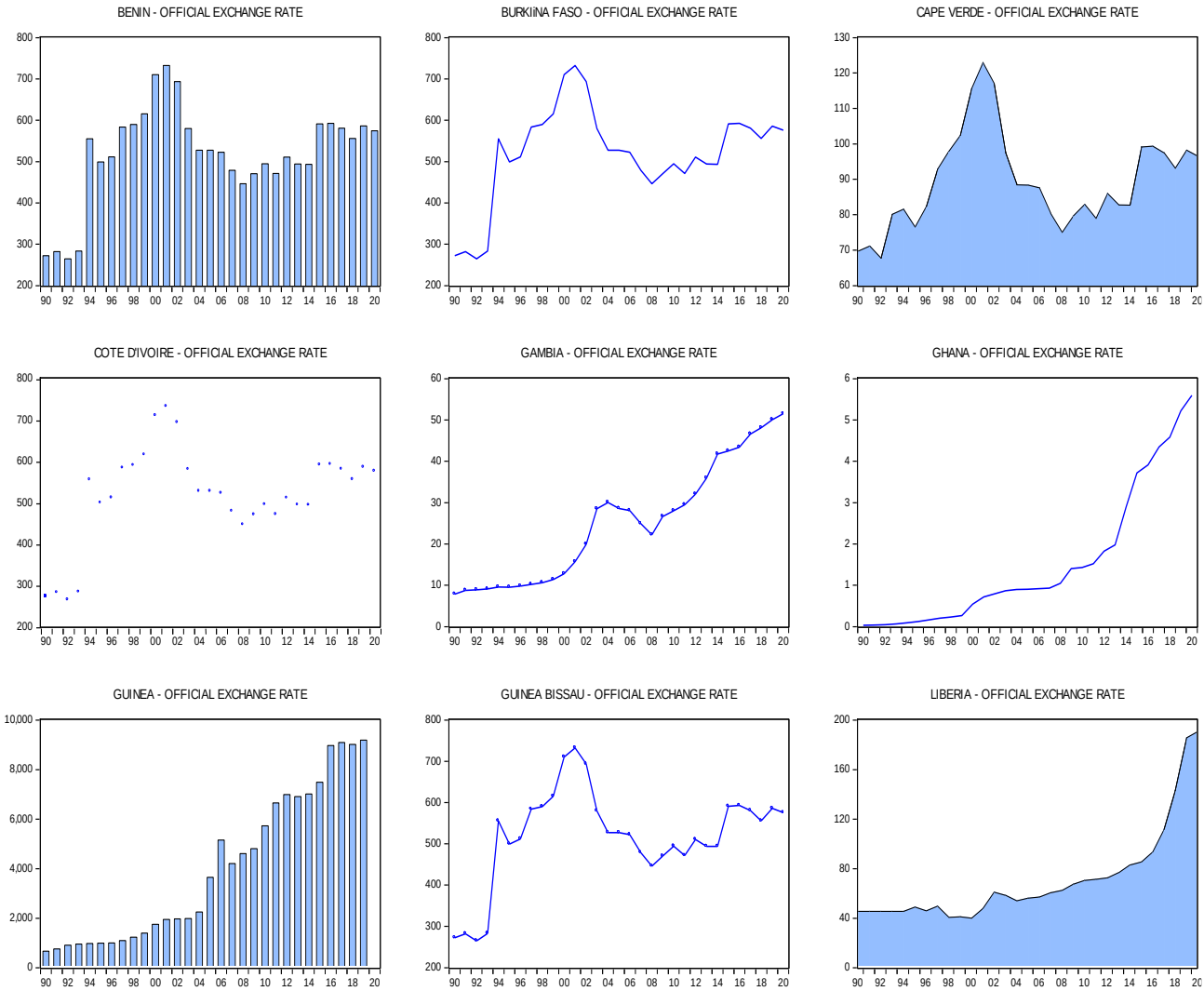

BENIN - OFFICIAL EXCHANGE RATE
BURKIINA FASO - OFFICIAL EXCHANGE RATE
CAPE VERDE - OFFICIAL EXCHANGE RATE
COTE D'IVOIRE - OFFICIAL EXCHANGE RATE
GAMBIA - OFFICIAL EXCHANGE RATE
GHANA - OFFICIAL EXCHANGE RATE
GUINEA - OFFICIAL EXCHANGE RATE
GUINEA BISSAU - OFFICIAL EXCHANGE RATE
LIBERIA - OFFICIAL EXCHANGE RATE

Fig. 3.7

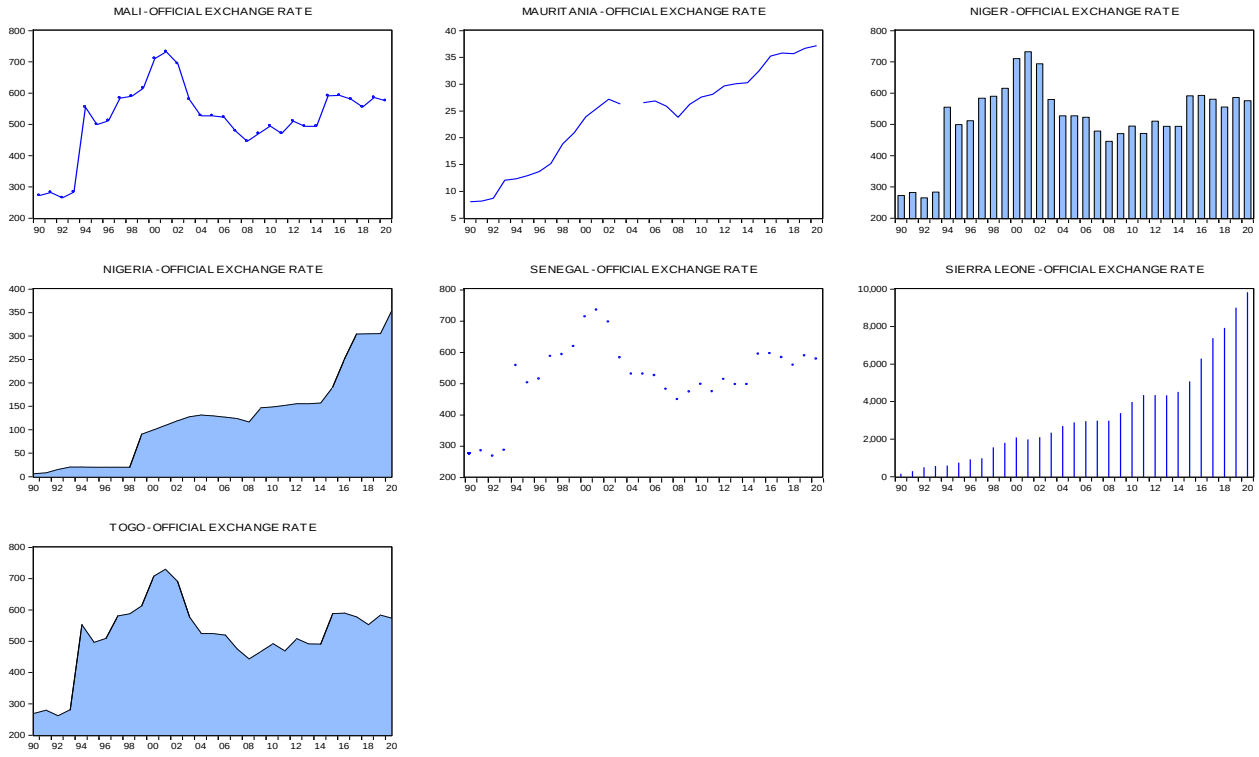


Fig. 3.8

Similarly, because of the unstable nature of exchange rate in the West African countries, the study takes into consideration the state of exchange rate across some countries. In 1985, Nigeria exchange rate between the Nigerian Naira and US Dollar and Naira is $1: ₦1, however in 1986 the currency depreciates to $1: ₦3.32. This reason was attributed to the dynamics of market forces following the introduction of Second-Tier-Foreign-Exchange-Market which is the major component of Structural Adjustment Programme of 1986. It further depreciates to $1: ₦9.76 in 1993, and $1: ₦92.53 in 1999. In 2009, the reduction in the value of Nigerian currency skyrocketed to $1: ₦150.66 before slight currency appreciation in 2013 estimated at $1:150.30 (CBN, 2017). The condition of Nigerian currency exacerbated in 2021 as $1 is exchanging for ₦410 as official rate and ₦505 in the black market as at July 10, 2021. In the Republic of Benin, Senegal, Guinea-Bissau, Burkina Faso, Mali, and Niger, the average value of CFA francs per US dollars between 2004 and 2021 is 525.3923 CFA France with the highest value in December 2016 at 622.8211

CFA Francs and the minimum at 415.9999 CFA Francs. Cape Verde has minimum value of 74.7564 Escudos per dollar, the maximum value of 104.5567 and average value between 2004 and 2021 recorded at 90.2629 Escudos per US dollar. The Gambian Dalasi showed a minimum value of 19.0466 per dollar in 2007 and the highest value of 51.8155 Dalasi per USD was found in August 2020; however, the average value of 36.0049 Gambian Dalasi was recorded between 2004 and 2021. In Ghana, the Ghanaian cedis show average value of 3.4813 cedis per dollar during the period of 2004 -2021, the highest value is found in December, 2020 at 5.8643 cedis while the lowest value within the period is 1.4187 cedis per dollar. However, the Guinea Francs per US dollar show a minimum record of 2500.0001 Guinea Francs in September, 2004 and the maximum value 10227.4963 Guinea Francs in January, 2021 while Liberian Dollar and Mauritania Ouguiyas per USD indicate the lowest value of 67.376 Liberian Dollar and 228.993 Ouguiyas in August, 2008 and December,2008 respectively (The Global Economy, 2021).

CHAPTER THREE

METHODOLOGY

3.1 Theoretical Framework

This study relied on the monetary approach to exchange rate and inflation rate determination. The monetarist position is that in a floating exchange rate system, the determination of exchange rate rests on the demand for and supply of exchange rate. This postulation emerged in 1970 as the most dominated exchange rate model among other theories. This model is referred to as monetary approach and the idea is hinged on the fact that the determinable factor of two countries dependent on their demand for foreign notes and supply of it which invariably leads to general price level.

Given the assumption of the model, monetary approach to exchange rate states that the excess money in the circulation creates the outflows of capital, and then leads to exchange rate depreciation, i.e. lower value of domestic currency if the country operates floating exchange rate system. Also, the factor that leads to excess demand for money can result in appreciation of domestic currency. Therefore, the factors that determine exchange rate are equivalent to those that influence excess of supply for, and demand for money. Thus, exchange rate assumption leads to inflation rate is unexpectedly rested on the connection linking country's money supply to inflation rate. In this study, how monetary policy factors lead to inflationary rate both at short period or long term were examined and how movement/changes in the rate of exchange affect inflation. The study adapted the framework considered by Soderstein and Reed (1994) and cited in Folawewo (2011). The framework suggested that over the long period, the postulation of stable funds demand and the purchasing power parity holds in the economy. This means that the function of the rate of interest and income is demand for money. The framework begins with money demand as stated below.

$$M_d = K.P.Y^a.I^b \quad (3.1)$$

Where $M_d = MoneyDemand$, P= General Price Level, Y= Real National Output, I =Nominal Interest Rate , K=Constant , a and b are parameters.

Assuming the money demand and supply is to be exogenous and the money market is at equilibrium, the equation (3.1) can be rewritten as

$$\frac{M}{P} = f(y, i) \quad (3.2)$$

Thus, the assumption that demands for real money and supply of money depends on domestic interest rate and real income. We then express equation (3.2) in log form which resulted in

$$-\omega i + \delta y = M - P \quad (3.3)$$

Money supply is set by monetary authorities while inflation is taken. Therefore, nominal quantity of money and the real money income are taken as given. Therefore, the equation (3.3) is rearranged to have the following.

$$P = M + \omega i - \delta y \quad (3.4)$$

The exchange rate is established with the assumption that purchasing power persists.

$$E = \frac{P}{P^*} \quad (3.5)$$

This means that exchange rate (E) adjust to the ratio of domestic price P and foreign price P*.

On the theoretical context, Friedman (1959) postulated that higher inflation in any given period is associated with higher money supply. Akinbobola, (2012); Ogunseye and Bada, (2012) ascertain that a rise in inflation rate in developed countries was attributed to the quantity of money supplied. However, there are many variables considered as major sources of inflation which are attributed to both monetary and fiscal economists. The monetarists associated recent inflation to balance of payments deficit, and exchange rate. Fluctuations affect import price which is transferred into domestic price level. For instance, the increase in price of all final goods imported is influenced

by rising depreciation in currency value. Therefore, unstable and fluctuation in exchange rate affects the domestic inflation. Also, fiscal economists attributed inflation to tax aspects, economic growth, budget deficit, and demand-pull (aggregate demand). The Keynesian school of thought argued that growth and investment opportunities can lead to inflation (Jung & Marshall, 1986). Generally, based on the above assumptions, inflation can be a function of monetary and fiscal policies coupled with other unexpected shocks to the system. This study relies on the original linear model of monetarist theory of money supply and price level. The statement is modeled in equation (3.1).

Meanwhile, exchange rate fluctuation (depreciation or appreciation) is perceived to be inflationary or otherwise as the price of imported goods rises or falls, and most especially the depreciation is perceived to boost a country's trade balance as it becomes more competitive.

In order to distinguish between the future exchange rate and the spot exchange rate, we assume the rate of depreciation to be

$$x = \emptyset(e - y) \tag{3.6}$$

Where x is expected exchange rate behaviour, e represents future exchange rate, y denotes spot exchange rate. The relationship between the spot (current) exchange rate, future (long-run) and the price level is given under the assumption of purchasing power parity. This idea states that the ratio between the relative price levels of the two countries should be the same as the exchange rate between their respective currencies.

Considering that an equation-like representation of the relationship between the exchange rates of two open economies exists. Take Pn be only the benchmark commodities basket's naira price in Nigeria and P$ be its dollar price in the United States. According to PPP, the naira should be valued at and the dollar at,

$$s = \frac{Pn}{P\$} \quad (3.7)$$

where "S" stands for the price of a dollar in naira. The fundamental idea is that a certain currency should be able to buy the equivalent amount of things in another nation.

Alternatively, the equation 7 can be presented as follows:

$$pn = S * \mathrm{P}\$ \quad (3.8)$$

This equation opines that the dollar price of the commodity in Nigeria, that is "Pn" must be the same as the Naira value of the commodity basket in USA. Thus, purchasing power parity affirms that the price of commodity must be the same across countries when measured in common currency. However, the above absolute assumption is not always valid due to some inherent factors and difference between developing and developed nations. Furthermore, the relative version or rate of change form can be presented as follows:

$$e = \beta n - \beta\$ \quad (3.9)$$

Where "e" is the rate of change in the exchange rate and 'βn' and 'β$' are the inflation rates in Nigeria or another West African Region, and the USA respectively. Increased import costs can cause inflation directly or indirectly by driving up domestic prices for imports, which raises demand for domestic commodities and drives up prices until equilibrium is restored.

So, $P = EPf$ (3.10)

Equation 10 exists if the domestic price (P) of a good is equal to the foreign market price (P) of the same good, where (E) is the exchange rate expressed in domestic currency units per unit of foreign currency. The assumption is that even if the above equation does not hold, and the stability in the factors determining exchange rate over time will make the percentage change in price level (P) equal to percentage change in exchange rate (E), this statement could model as follows,

$$\Delta \frac{p}{p} = \Delta \frac{E}{E} \quad (3.11)$$

This can be approximated as:

$$\frac{P}{P1} = \frac{E}{E1} \div \frac{P1}{P1} \tag{3.12}$$

Thus, local inflation is determined by adding the rates of currency depreciation and overseas inflation.

However, it was further stated that changes in real exchange rate resulted from the changes in the nominal exchange rate and prices of goods both in home and foreign countries.

$$REER = NEER \times \frac{P1}{P} \tag{3.13}$$

Where REER is real exchange rate, *EXR* represents Nominal Exchange Rate, $\frac{P1}{P}$ implies theratio of domestic prices to those in other countries.

$$\frac{REER}{REER1} = \frac{E}{E} + \frac{P}{P1} - \frac{P}{P} \tag{3.14}$$

$$\frac{REER}{REER1} = \frac{E}{E} + \frac{P}{P1} - (\frac{E}{E} + \frac{P}{P1}) = 0 \tag{3.15}$$

As a result, since the REER is constant, variations in the nominal exchange rate (E) cannot be utilized to change it. Any gain in competitiveness (increase in E) brought on by a devaluation will be entirely offset by a corresponding rise in domestic pricing (increase in P). Given that adjustment might not happen right away, this is effectively a long-term partnership. It could take some time for domestic price hikes to make up for an initial depreciation (raise) of the REER. If this theory is correct, domestic prices and the nominal exchange rate have a long-term relationship whereas the nominal and real exchange rates do not (while retaining constant overseas prices).

3.2 Model Specification

This study models after the existing assumptions of Classical and Monetarist views on inflation rate/price level as a monetary phenomenon. Also, it adopts the model of Dornbush (1987), Agenor and Montiel (1996); Brooks, (2002) and Monfared and Akin (2017) as the basis for this assumption. The monetarist and classical model of the causes of inflation is given in the following manner as a simplified version:

$$P = M + X' \tag{3.16}$$

Where P is the price level, M is the money supply and X' is a vector of other variables to be included in the model as proposed by monetary and fiscal economists.

Furthermore, this study assumes that prices react to excess money stock and other factors in the general market. It is on the basis that it is possible to invert the mechanism for transmitting money of which exchange rate policy is an aspect and money supply as price equation:

$$P = f(M, REER) \tag{3.17}$$

Where *REER* is real exchange rate. Therefore, it is essential to emphasize that a change in exchange rate due to the fact that monetary authorities' policies will affect the price level. In order to model the argument of the study that there are some important fiscal and monetary indicators that jointly influences the fluctuation of exchange rate to cause inflation in the West African countries. Therefore, equation (3.17) is further expanded to accommodate variables like unemployment rate, trade openness; balance of payments and economic growth to represent the influence of macroeconomic variables while Interest rate and money supply represent monetary variables and Public Debt, Government Spending and Taxation to represent fiscal policy indicators. Thus the baseline equation is:

$$INF = f(EXR, EXRv) \tag{3.18}$$

Where *EXR* is the real exchange rate and *EXRv* is exchange rate volatility which is derived through ARCH model. The inclusion of *MOP* which is monetary policy instruments indicates the implications of policies of monetary authorities to manage the economy which indirectly influence the rate of inflation through exchange rate.

$$INF = f(EXR, MSP, UEMP, TROP, BOP, GDPGR, INTR, PPI, VAD, PD, GSP, TAR) \quad (3.19)$$

The econometric and empirical form of the model is specified as follows;

$$INF = \alpha + \beta_1 EXR + \beta_2 MSP + \beta_3 UEMP + \beta_4 TROP + \beta_5 BOP + \beta_6 GDPGR + \beta_7 INTR + \beta_8 PPI + \beta_9 VAD + \beta_{10} PD + \beta_{11} GSP + \beta_{12} TAR + \beta_{13} EXRv + \mu \quad (3.20)$$

Due to the nature of this study the equation (3.20) will be transformed into panel model in equation (3.21).

$$Inf_{it} = \alpha + Inf_{it}\beta_1 + EXR_{it} + \beta_2 MSP_{it} + \beta_3 UEMP_{it} + \beta_4 TROP_{it} + \beta_5 BOP_{it} + \beta_6 GDPGR_{it} + \beta_7 INTR_{it} + \beta_8 PPI_{it} + \beta_9 VAD_{it} + \beta_{10} PD_{it} + \beta_{11} PD_{it} + \beta_{12} TAR_{it} + \beta_{13} EXRv_{it} + v_{it} + u_t \quad (3.21)$$

Where, INF is inflation rate, EXR stands for Exchange Rate, MSP depicts Money Supply, UEMP is Unemployment rate, TROP connotes Trade Openness, BOP represents Balance of Payments, GDPGR is Gross Domestic Product Growth Rate, INTR depicts Interest Rate, PPI connotes Producer Price Index (raw material cost), VAD is Value Added of the sector, PD represents Public Debt, GSP stands for Government Spending, TAR depicts Tax Revenue, EXRv represents Exchange Rate Volatility, α is the constant, $\beta_1 - \beta_{13}$ are coefficients to be estimated, i stands for Country, t represents Time, vit is the individual residual which is the random characteristic of unit observation or individual specific effect , u_t represents the error term across time.

3.2.1 Apriori Expectation

This section relies on the general idea from existing theories and the researcher's line of argument and thought about the expected influence of each variable included in the equation. This is the basis for the assumptions provided by this study to contribute and enhance existing body of empirical evidence on the subject matter.

Table 3.1. Apriori Expectation

S/N	Variables	Symbol	Parameter	Expected	Signs
1	Exchange Rate (Appreciation and Depreciation)	EXR	β_1	Positive	>0
2	Money Supply	MSP	β_2	Positive	>0
3	Unemployment Rate	UEMP	β_3	Positive	>0
4	Trade Openness	TRO	β_4	Positive	>0
5	Balance of Payments	BOP	β_5	Negative	<0
6	Gross Domestic Product Growth Rate	GDPGR	β_6	Negative	<0
7	Interest Rate	INTR	β_7	Negative	<0
8	Producer Price Index	PPI	β_8	Positive	>0
9	Value Added	VAD	β_9	Positive	>0
10	Public Debt	PD	β_{10}	Positive	>0
11	Government Spending	GSP	β_{11}	Positive	>0
12	Tax Revenue	TAXR	β_{12}	Positive	>0
13	Exchange Rate Volatility	EXRv	β_{13}	Positive	>0

Source: Authors Computation, 2022

The anticipated signs in this study follow the economic intuitions and theoretical understanding at the monetarist and fiscal theories both in the short run and long run. In relation to the interest of the study, devaluation/depreciation of country's currency is envisaged to be inflationary in nature both in the short run and long run; therefore, it is expected to have positive sign. Since the increase in imported goods will affect the price of domestic consumer price index, it is expected that trade openness will expose the host countries to unexpected imported inflation. However, it also helps

the country to expand exporting items to generate inflows as predicted by flow trade approach. Therefore, trade openness is expected to have a positive direction with inflation, but the degree must be carefully managed. Also, expansionary monetary and fiscal policies are expected to be inflationary in nature both in the shortrun and long run. For instance, Balance of payment position is expected to be negative while money supply is expected to be positive and interest rate which is a monetary control measure to reduce hike inflation is expected to be negative in the model. Government spending, taxation and public debt are expected to have positive influence on inflationary pressures in West African countries. Unemployment was selected on the basis of macroeconomic intuition to maintain full employment of resources. Industrial country standard has been assumed to contribute to high inflation rate. Therefore, the industrial value added is expected to contribute to inflation due to cost implication approach. It is noted in the empirical literature that macroeconomic performance helps to check inflation and inflationary pressures in the short-run and long-run. Thus, economic growth rate is expected to be negative so that inflation can be reduced, as economic growth is inversely related to inflation.

3.2.2 Estimation Technique

Due to the nature of data, the study employs various descriptive analyses such as mean table and graphical representations of variables. The baseline regression is estimated using multiple linear regression models to identify the relationship between exchange rate fluctuations and inflation rate. Because of the seasonal variation of the exchange rate and the stationarity analysis, the study adopted Panel ARDL method of analysis, and bound test to determine the longrun relationship with Panel-ECM for the shortrun adjustment. The reason for adopting Panel ARDL is that all the variables are not likely to behave in the same manner which might negate the condition of using Ordinary Least Square method. Also, in order to incorporate I(0) and I(1), Psarian, Shin, and Smith

(2001) develop Bound testing to analyze the relationship. One of the gaps where this study has bridged is the determination of Pass-through effect of exchange rate fluctuations on inflation rate. To solve this problem, the study employed non-linear ARDL. The granger causality was considered to solve the problem of causal relationship among the adopted variables. Furthermore, the volatility of the exchange rate was determined through ARCH model.

3.2.3 Test for short-run and Long-run linear relationship

In defining the ARDL equation, the study adheres to Revelli (2020). Because the Panel ARDL has a number of advantages over the conventional technique of testing co-integration, this is how it came to be created. In the first place, this approach can be used with variables that combine I(0) and I (1). The Panel ARDL bound test approach, on the other hand, allows us to estimate both the short-term and long-term relationships between variables concurrently. Moreover, the ARDL model addresses the endogeneity problem by incorporating lags for dependent and independent variables.

The null hypothesis suggests that no long-run relationship exists if the calculated F-statistics value is less than the lower bound critical values, I(0) and the I(1) critical bound which indicates that there is no long-run correlation between the regressand and regressors.

Consequently, if the bounds test indicates that there is co-integration among the variables, long-run relationship $exists$.

$$\Delta INFit = \beta o + \Phi_1 \Delta infl_{I,t-1} + \Phi_2 \Delta EXR_{I,t-1} + \Phi_3 \Delta MSP_{I,t-1} + \Phi_4 \Delta UEMPL_{I,t-1} + \Phi_5 \Delta TROP_{I,t-1} + \Phi_6 \Delta GDPGR_{I,t-1} + \Phi_7 \Delta INT_{I,t-1} + \Phi_8 \Delta PPI_{I,t-1} + \Phi_9 \Delta PD_{I,t-1} + \Phi_{10} \Delta EXRV_{I,t-1} + \Phi_{11} \Delta BOP_{I,t-1} + \Phi_{12} \Delta VAD_{I,t-1} + \Phi_{13} \Delta GSP_{I,t-1} + \varepsilon t \quad (3.22)$$

Where p is the highest lag order and Δ is the first-difference operator. The F-statistics are used to determine whether a long-term relationship actually exists. The coefficient ($\boldsymbol{\Phi}_{1,}$ -, $\boldsymbol{\Phi}_{14,}$) corresponds with short run dynamics of the model, while (β_J) represents the long-run relationship.

H_0: long-run significant relationship does not exist

H_1: the long-run significant relationship exists

Given that co-integration exists, hence we estimate the coefficient of the long run model. The long run model specification is as shown below:

$$\Delta INFit = \sum_{j=0}^{p} \beta\, j\Delta infl_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta EXR_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta MSP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta UEMPL_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta TROP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta GDPGR_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta INT_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta PPI_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta VAD_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta PD_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta GSP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta BOP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta EXRV_{I,t-1} + \varepsilon t \quad (3.23)$$

Appropriate lag selection criterion such as AIC was used as the sample size and the maximum lag (*p*) were selected based on appropriate criterion.

The Autoregressive distributed lag model of the short-run model is correctly specified, this was derived from the error correction model as shown below:

$$INFit$$

$$= \sum_{j=0}^{p} \beta\, j\Delta infl_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta EXR_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta MSP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta UEMPL_{I,t-1}$$

$$+ \sum_{j=0}^{p} \beta\, j\Delta TROP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta GDPGR_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta INT_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta PPI_{I,t-1}$$

$$+ \sum_{j=0}^{p} \beta\, j\Delta VAD_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta PD_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta GSP_{I,t-1} + \sum_{j=0}^{p} \beta\, j\Delta BOP_{I,t-1}$$

$$+ \sum_{j=0}^{p} \beta\, j\Delta EXRV_{I,t-1} + \partial ECM_{I,t-1}$$

$$+ \varepsilon t \qquad (3.24)$$

In conclusion, all the short-run coefficient models are coefficients explaining the short-run dynamics which show the meeting point of the model to (∂) and which represents the re-parameterization of errors generated in one period and corrected in the subsequent period.

3.2.4 Test for Non-linear ARDL

Comparable to the ARDL model, the use of NARDL methodology do not necessarily contain all the variables in the model to be integrated in the same direction. This study rests on Shin, (2014); Gbosi, 2017; Khan and Wang (2021); and Raifu, Aminu & Folawewo, (2020). The NARDL was considered to capture the asymmetric relationship (non-linear relationship) among the variables employed in the study. The exogenous variable Y is divided into its positive and negative partial sums using this process. i.e. Yt^{+} and Yt^{-} , of increase and decrease.

The following is the model for NARDL:

$$\Delta INF_{it} = \beta_0 + \beta_1 \Delta INF_{i,t-1} - 1 + \beta_2 \Delta EXR^{-}_{i,t-1} + \beta_3 \Delta EXR^{+}_{i,t-1} + \beta_4 \Delta MSP^{-}_{i,t-1} +$$

$$\beta_5 \Delta MSP^{+}_{i,t-1} + \beta_6 \Delta GDPGR^{-}_{i,t-1} + \beta_7 \Delta GDPGR^{+}_{i,t-1} + \beta_8 \Delta INT^{-}_{i,t-1} + \beta_9 \Delta INT^{+}_{i,t-1} +$$

$$\beta_{10} \Delta PPI_{i,t-1} + \beta_{11} \Delta PD_{i,t-1} + \beta_{12} \Delta VAD_{i,t-1} + \beta_{13} \Delta GSP_{i,t-1} + \beta_{14} \Delta UEMP_{i,t-1} +$$

$$\beta_{15} \Delta TROP_{i,t-1} + \beta_{16} \Delta BOP_{i,t-1} + \beta_{17} \Delta TAR_{i,t-1} + \beta_{18} \Delta EXRV_{i,t-1} + \mu \quad (3.25)$$

$$\begin{aligned}
&\Delta INF_{it} \\
&= \beta_0 + \sum_{j=0}^{p} J\, \beta_1 \Delta INF_{i,t-1} + \sum_{j=0}^{p} J\, \beta_2 \Delta EXR^{-}_{i,t-1} + \sum_{j=0}^{p} J\, \beta_3 \Delta EXR^{+}_{i,t-1} + \sum_{j=0}^{p} J\, \beta_4 \Delta MSP^{-}_{i,t-1} \\
&+ \sum_{j=0}^{p} J\, \beta_5 \Delta MSP^{+}_{i,t-1} + \sum_{j=0}^{p} J\, \beta_6 \Delta GDPGR^{-}_{i,t-1} + \sum_{j=0}^{p} J\, \beta_7 \Delta GDPGR^{+}_{i,t-1} + \sum_{j=0}^{p} J\, \beta_8 \Delta INT^{-}_{i,t-1} \\
&+ \sum_{j=0}^{p} J\, \beta_9 \Delta INT^{+}_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{10} \Delta PPI_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{11} \Delta PD_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{12} \Delta VAD_{i,t-1} \\
&+ \sum_{j=0}^{p} J\, \beta_{13} \Delta GSP_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{14} \Delta UEMP_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{15} \Delta TROP_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{16} \Delta BOP_{i,t-1} \\
&+ \sum_{j=0}^{p} J\, \beta_{17} \Delta TAR_{i,t-1} + \sum_{j=0}^{p} J\, \beta_{18} \Delta EXRV_{i,t-1} + \partial ECMt\ - 1 \\
&+ \varepsilon t
\end{aligned} \quad (3.26)$$

3.3 Data Sources and Measurements

This study used World Bank Development Indicators (WDI) as a conduit where data for each country were extracted on each of the variables considered in the study. The data covered a 31-year period from 1990 to 2020 across countries in West African Region for the analysis.

Exchange Rate (Appreciation and Depreciation) is the price of a local currency in exchange for another currency. This is sourced from World Bank Development Indicators. Broad money (M2) is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities. This is sourced from World Bank Development Indicators.

Unemployment Rate is the percentage of the labour force that is without work but available for and seeking employment. This is sourced from World Bank Development Indicators. Trade Openness is the percentage of the Gross Domestic Product. This is sourced from World Bank Development Indicators. Balance of Payments refers to the Current account balance in US dollar. This is sourced from World Bank Development Indicators. Gross Domestic Product Growth Rate is the GDP growth rate percentage in constant US$. This is sourced from World Bank Development Indicators. Interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. This is sourced from World Bank Development Indicators.

Producer Price Index is the crude oil price index. This is sourced from World Bank Development Indicators.

Value Added is value added percentage of GDP of Industry, including construction. This is sourced from World Bank Development Indicators. Public Debt refers to Central government debt stock in US dollar. This is sourced from World Bank Development Indicators. Government spending refers to general government final consumption expenditures including all government current expenditures for purchases of goods and services. This is sourced from World Bank Development Indicators. Tax revenue refers to funds collected from taxes on various tax bases. This is sourced from World Bank Development Indicators. Exchange Rate Volatility is a risk associated with uncertainty in the exchange rate in international trade. This is generated from ARH model. Inflation Rate can be used interchangeably as Consumer Price Index. This is sourced from World Bank Development Indicators.

Table 3.2. Data Sources and Measurements

S/N	Variables	Denotation	Description /Measurements	Source
1	Exchange Rate (Appreciation and Depreciation)	EXR	Price of local currency against US dollar	World Bank Development Indicators/ NARDL
2	Money Supply	MSP	Broad money (M2) is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities	World Bank Development Indicators

3	Unemployment Rate	UEMP	Share of the labour force that is without work but available for and seeking employment.	World Bank Development Indicators
4	Trade Openness	TRO	Trade percentage of the GDP.	World Bank Development Indicators
5	Balance of Payments	BOP	Current account balance in US $	World Bank Development Indicators
6	Gross Domestic Product Growth Rate	GDPGR	This is the GDP growth rate percentage (in constant US$).	World Bank Development Indicators
7	Interest Rate	INTR	Interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator.	World Bank Development Indicators
8	Producer Price Index	PPI	Crude oil price index	World Bank Development Indicators
9	Value Added	VAD	Industry(Including construction) value added(%of GDP)	World Bank Development Indicators
10	Public Debt	PD	Central government debt stock in US $	World Bank Development Indicators
11	Government Spending	GSP	General government final consumption expenditures include all government current expenditures for purchases of goods and services.	World Bank Development Indicators
12	Tax Revenue	TAXR	Tax revenue (current Local Currency Unit)	World Bank Development Indicators

13	Exchange Rate Volatility	EXRv	ARCH Model	E-view
14	Inflation Rate	INF	Consumer price index. (2010 = 100).	World Bank Development Indicators

Source: Authors Computation, 2022

Autoregressive Conditionally Heteroscedasticity (Arch) Model to Measure and generate Volatility data

The full model is stated below:

$$y_t = \beta_1 + \beta_2 x_2 + \cdots \ldots \ldots . + \beta_k x_{kt} + u_t, u_t \sim N(0, \sigma^2) \quad (3.27)$$

Where,

$$\sigma^2{}_t = \alpha_0 + \alpha_1 u^2{}_{t-1} \quad (3.28)$$

We can easily extend this to general case where the error variance depends on q lags of squared errors

$$\sigma^2{}_t = \alpha_0 + \alpha_1 u^2{}_{t-1} + \alpha_1 u^2{}_{t-2} + \cdots \ldots \alpha_1 u^2{}_{t-q} \quad (3.29)$$

This is an ARCH (q) model

Instead of referring to σ^2 in the literature it is usually called h_t so, the model is

$$y_t = \beta_1 + \beta_2 x_2 +, \ldots \ldots \ldots , + \beta_k x_{kt} + u_t, u_t \sim N(0, h_t) \quad (3.30)$$

where,

$$h_t = \alpha_0 + \alpha_1 u^2{}_{t-1} + \alpha_1 u^2{}_{t-2} +, \ldots \ldots + \alpha_1 u^2{}_{t-q} \quad (3.31)$$

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

This chapter is devoted to empirical analysis and detailed discussion of the estimated results. In terms of sequencing, the descriptive analysis of variables is presented, followed by Correlation Matrix, Panel Unit Root test, Panel Co-integration, as well as the Regression Analysis results in line with the study objectives. This chapter also captures both ARDL and NARDL estimations for Anglophone and Francophone countries in both long run and short run. The latter part of the chapter contains the Stability test as the study adopted the proposed CUSUM test by Borensztein et al, (1998).

4.1: Presentation of Data

4.1.1. Descriptive Statistics

Table 4.1.1 revealed the descriptive statistics of the variables considered. In this table, the statistics trend in variables is described considering the Mean, Median, Standard Deviation, Skewness, Kurtosis and J-B probability. Balance of payment variable came with the highest mean and median during the period of analysis. This may be connected with the high volume of transactions as they occurred within West African countries during the period. Thus, volumes of exports and imports could have resulted in the high mean and median values compared to other variables. This was followed by the growth rate variable, demonstrating the period of positive growth rate within the region. However, general spending of government was highest in median value for the period; which is an indication of huge spending pattern of government during the period. Huge mean value of growth rate corroborated with its highest fluctuations during the period is demonstrated by the highest standard deviation. Considering this, it may be stated that Nigeria economic growth rate would have contributed to the huge fluctuations recorded during the period of analysis. All

skewness coefficients are negative except for those of exchange rate, economic growth, public debt, and unemployment rate. Only the economic growth variable has a long right tail among all the variables. All kurtosis coefficients are characterized with positive values. Again, the economic growth variable was highly leptokurtic during the time. It's intriguing to observe that all the variables were normally distributed on the basis that the probability values are less than the standardized 5% level. With this, variables for the analysis are well behaved.

The table further gives the details about the deviation of data from the original mean value. When standard deviation is low, it means that data are not widely deviated but when it is high it means that data were widely deviated. As can be seen in the table, the standard deviation for GDPGR, interest rate and balance of payment show a high standard deviation which means that the majority of West African countries exhibit high rate of disparities in gdpgr (26.26), balance of payment (9.32) and interest rate (21.91). Meanwhile, the standard deviation for the rest of the indicators exhibit low standard deviation which implies low deviation.

Table 4.1.1 Descriptive Statistics

Variable	Mean	Median	Std dev.	Skew	Kurt	J-Prob.
BOP	11.06	11.97	9.32	-0.04	1.43	0.7
EXR	3.63	3.54	3.56	0.22	1.91	0.82
GDPGR	4.15	1.46	26.26	1.08	3.84	0.46
GSP	3.31	4.42	2.28	-0.92	1.9	0.51
INF	0.97	1.42	4.73	-0.65	3	0.78
INR	-1.77	1.73	21.91	-1.07	3.78	0.47
MSP	2.51	3.11	1.69	-0.07	1.62	0.76
PD	2.9	3.42	2.19	0.22	2.02	0.85
PPI	2.43	2.54	1.73	-0.12	1.63	0.76
TROP	2.73	3.03	1.88	-0.54	1.79	0.68
UEMP	1.19	1.51	1.78	0.05	1.89	0.83
VAD	1.61	2.11	1.66	-0.15	1.84	0.81

Source: Author's computation, 2022.

4.1.2. Correlation Matrix

Table 4.1.2 shows the correlations matrix of the variables considered. The importance of this post estimation technique is to measure the level of association among all the variables. However, the correlation does not mean causation in absolute term. It helps to discover the existence of co-linearity and multi-colinearity in the model and identify any problematic variable. A quick look at the result depicts that there is absence of multi-colinearity among the variables because the value attached to each variable is less than 70% as asserted by Patrick, MMedStat and Lothar, (2018).

Table 4.1.2. Correlation Matrix

Variables	GSP	GDPGR	EXR	BOP	INR	MSP	PD	PPI	TROP	UEMP	VAD
GSP	1.00										
GDPGR	-0.07	1.00									
EXR	0.36	-0.01	1.00								
BOP	-0.2	0.1	-0.04	1.00							
INR	0.18	-0.03	0.02	-0.11	1.00						
MSP	0.41	-0.15	-0.11	-0.11	0.15	1.00					
PD	0.13	-0.3	-0.07	-0.16	0.03	0.23	1.00				
PPI	0.24	0.14	0.04	0.06	0.09	0.14	-0.32	1.00			
TROP	0.51	0	0.05	-0.08	0.11	0.68	0.23	0.24	1.00		
UEMP	0.3	-0.25	-0.17	-0.06	0.28	0.49	0.43	-0.02	0.38	1.00	
VAD	-0.44	-0.05	-0.4	0.05	-0.35	-0.24	0.04	-0.23	-0.37	-0.19	1.00

Source: Author's computation, 2022

4.1.3 Panel Unit Root Test

Table 4.1.3 is the panel unit root test of variables. This is necessary, so as to avoid spurious results arising from estimations. Tests of the panel unit root are based on the type and structure of data employed in which case whether the data would be balanced or unbalanced. In the current situation, the data set is unbalanced due to inevitable missing observations. Due to this issue, the study employed both the ADF and Phillips Perron test methods which are sufficient for the test of stationarity.

Tests of the panel unit results for variables showed that balance of payment, exchange rate, GDP growth rate, inflation rate, interest rate, crude oil prices and trade openness are stationary at their level, 1(0), using the ADF and Phillips Perron test procedures. However, money supply, external debt stock, crude oil price, unemployment and value added tax are stationary at their first difference level, 1(1). Gross national expenditure remains stationary in its level form using the panel ADF test method while it is stationary in its first difference level using the Phillip Perron test method. The fact that the variables are stationary at both levels and first difference levels calls for the use of the Autoregressive Distributed Lag Estimation technique.

Table 4.1.3: Panel Unit root test

Variable	Test Eqn.	Test Method	Prob.	Decision	OI	NC	N
BOP	Ind. Effects	ADF –Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(0) I(0)	16 17	298 326
EXR	Ind. Effects	ADF –Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(0) I(0)	17 17	459 477
GDPGR	Ind. Effects	ADF -Fisher PP-Fisher	0.01*** 0.02***	Stationary Stationary	I(0)	17 451	451 468
GSP	Ind. Effects	ADF -Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(1) I(0)	15 16	395 431
INF	Ind. Effects	ADF -Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(0) I(0)	17 17	411 428
INR	Ind. Effects	ADF –Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(0) I(0)	16 16	16 256
MSP	Ind. Effects	ADF -Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(1) I(1)	17 17	406 426
PD	Ind. Effects	ADF –Fisher PP-Fisher	0.00*** 0.00***	Stationary Stationary	I(1) I(1)	17 435	17 462
PP	Ind. Effects	ADF -Fisher, PP-Fisher	0.00*** 0.00***	Stationary	I(1) I(1)	17 445	17 462
TROP	Ind. Effects	ADF -Fisher, PP-Fisher	0.00*** 0.00***	Stationary	I(0) I(0)	16 432	16 448
UEMP	Ind. Effects	ADF -Fisher, PP-Fisher	0.00*** 0.00***	Stationary	I(1) I(1)	17 429	17 446
VAD	Ind. Effects	ADF -Fisher, PP-Fisher	0.00*** 0.00***	Stationary	I(1) I(1)	17 392	17 410

Source: Author's computation, 2022.

Note: Levels of significance are: ***p<0.10, ****p<0.05 and *****p<0.01 respectively.
OI: Order of Integration, **N:** Number of Observations and **NC:** Number of Cross-sections

4.1.4 Panel Co-integration

The condition to test for Panel data analysis was developed by Pedroni, (1999) to test the long run relationship. The test has seven estimators to be considered for the acceptance of co-integration based on 5percent level of significance. Therefore, in the table 4.1.4 since the majority of the estimation p-value is less than 5percent significance level, it was concluded that the model has long-run relationship.

Table 4.1.4 Co-integration Analysis (Pedroni Test)

Pedroni Residual Co-integration Test				
Sample: 1990 – 2020				
Cross-sections included: 14 (2 dropped) in non-parametric (PP) test; 13				
Null Hypothesis: No co-integration				
	Statistic	Probability	Weighted Statistic	Prob.
statistic on Panel V	-5.852	1.0000	-5.618211	1.0000
Statistic on Panel rho	2.783508	0.9973	2.543029	0.9945
Statistic on Panel PP	-5.2657***	0.0000	-8.099137***	0.0000
Panel ADF-Statistic	-3.4978***	0.0002	-1.176775	0.1196
Individual ARE coefficient				
	Value	Probability		
Rho-Statistic group	4.376892	1.0000		
PP-Statistic group	-11.069***	0.0000		
ADF-Statistic group	-4.6733***	0.0000		

Source: Author's computation, 2022.

Note: Levels of significance are: *****p<0.10, ******p<0.05 and *******p<0.01 respectively.

4.2 Regression Analysis Results

Relationship between Exchange Rate Fluctuations and Inflation Rates in West Africa

Table 4.2.1, describes the short-run coefficients of explanatory variables in the inflation equation. In the shortrun, the lags of inflation up to the fourth lag relate positively with current inflation rate but the relationship is significant for the first and the third lags. By implication rising consumer prices appear to follow similar trend within the short run in the region. This means that there is persistent inflation in the model. However, the third lag inflation impacted much more compared to other inflation lags. Precisely, 1% increase in the third lag brought about a significant increase of about 0.33% in the current inflation rate. Thus, inflation has been a fundamental issue, and it is one of the growth-drags as experienced by the region. As expected, we also found negative effects of the growth rate of GDP per capita and interest rate on inflation rate of the West African region countries.

Exchange rate volatility was carried out on each country included in the study. ARCH model and conditional variance were considered to arrive at the series of volatility. The volatility measures are calculated in three steps: (i). simple linear regression such as EXR=f (EXR (-1) was carried out, (ii). Test for the presence of ARCH effect was done. (iii). Model for the conditional variance to derive volatility was conducted to generate volatility series for each country. Since the software is limited to run volatility for panel data, modeling series by series has been chosen as preferred strategy. Therefore, the first and second lags of exchange rate volatility relate positively, though negligible, not significant with current inflation rate during the period of analysis. It was found out that a unit increase in exchange rate volatility both at level and two years' lag will increase inflation rate by 0.0005 and 0.00 respectively. A high rate in exchange rate instability of the last two years resulted in general increase in average price level in the current period. This is an indication that

instability in exchange rate leads to unstable price levels and an apparent distortion in economic activities. Current balance of payment impacted negatively with inflation rate during the period. From the results, 1% increase in the balance of payment induced a decrease of about 0.01% in inflation during the period. The growth variable from the first through the third lag impacted negatively on inflation rate in the region. Increasing growth rate implies increase in the investment level and output and thus low inflation rate. However, growth rate in the region has been nominal which not a representative of the entire populace. Nigeria had a very impressive growth in 2014 but such was seen not to be representative of the populace as poverty, inequality and economic imbalances still persisted.

Interest rate impacts for the first and second lags are in opposite direction. The first lag of interest rate showed a positive impact implying that a rising interest rate was likely to reduce investment and resulted in short supply, hence rising average price levels. Crude oil prices in its first lag impacted positively on inflation rate. Traditionally, rising oil prices triggers increase in commodity prices including cost of capital. In the long-run coefficients, it was found out that exchange rate volatility, balance of payment, growth rate and interest rate negatively impacted inflation rate. It was recorded that the degree of changes is 0.05, 0.06, 0.39 and 0.004 in inflation rate. This implies that a shift from the equilibrium level will cause a reduction in inflation through interest rates intensifying and growing in the pace of economic growth. However, producer price index that was proxy with crude oil prices was found to be positive. This connotes that a slight change in the price of crude oil will increase the cost of production of both foreign producer and local producer which imminently increase the price of goods and services. It is indicated that the inflation will be increased by 0.04 units.

The adjusted coefficient of determination shows that about 43% in the inflation rate variation was taken care of by the explanatory variables; exchange rate volatility, balance of payment, Rates of inflation in their various forms, including the inflation rate itself, interest rates, crude oil prices, and GDP growth. As a result, the outcomes depend on how many explanatory variables were used in the model. The likelihood F statistic demonstrates the model's suitability, and the Durbin Watson value demonstrates the model's low degree of auto-correlation.

Table 4.2.1. Regression Analysis Result on the Relationship between Exchange Rate Fluctuations and Inflation Rates in West Africa

SHORT RUN			LONG RUN				
Variable	**Coeff.**	**Prob.**	**Std. Err**	**Dep. Variable/ inf.**	**Coeff.**	**Prob.**	**Std. Err**
Inf(-1)	0.26***	0.00	0.0839	EXRv	-0.05	0.33	0.0516
Inf(-2)	0.11	0.16	0.0768	BOP	-0.06	0.74	0.1918
INFL(-3)	0.33***	0.00	0.0693	GDPGR	-0.39	0.17	0.2282
INF(-4)	0.07	0.39	0.0833	INR	-0.004	0.98	0.1242
EXRv	0.00005	0.58	0.0009	PPI	0.04*	0.07	0.0198
EXRv(-1)	-0.02**	0.03	0.0069	C	4.48	0.2	
EXRv(-2)	0	0.5	0.0062	F-stat.	5>2.38 Upper bound		
BOP	-0.01	0.74	0.0441	LM TEST	0.12		
GDPGR	-0.02	0.54	0.0282	HETRO. TEST	0.34		
GDPGR(-1)	-0.05	0.15	0.0317				
GDPGR(-2)	-0.03	0.43	0.0316				
INR	-0.04*	0.07	0.0198				
INR(-1)	0.04*	0.07	0.01972				
PPI	-0.001	0.77	0.0043				
PPI(-1)	0.01**	0.03	0.0040				
C	1.02	0.21					
R^2	0.49						
R^2 Adjusted	0.43						

Source: Author's Computation, 2022.

Note: Levels of significance are: ***p<0.10, ****p<0.05 and *****p<0.01 respectively.

Relationship between Exchange Rate Pass-Through and Inflation Rate in West Africa

Table 4.2.2, depicts the impact of exchange rate pass-through to inflation. The explanatory variables considered in this case are lags of inflation up to the fourth lag, volatility that represents interaction between inflation and exchange rate dynamics, lags of exchange rate variable up to the third lag and exchange rate volatility variable. Inflation remains the independent variable.

The results of the exchange rate pass-through while accounting for inflation in the region show some mixed results. The volatility measure interacted with exchange rate with inflation dynamics for the period indicated that inflation environment had a negative significant effect on exchange rate pass-through. Given a rise in volatility, exchange rate pass-through showed a significant downward effect on price dynamics although it is highly negligible. By implication, within the next period, the effect on exchange rate pass-through may be unstable. The exchange rate pass-through responded positively to one period lag of inflation and third period lag of inflation. This points to the fact that exchange rate pass-through became higher for the period of more volatile periods of inflation. Thus, a period characterized by apparent macroeconomic instability would accompany increasing levels of exchange rate pass-through. This may not be far from following the economic instability history of the region and further aggravated by the episodes of recessionary periods of say (2007-2009), (2015-2016) among other economic shocks. Emergence of covid-19 pandemic was also a contributing factor to downturn of the economy, reduction in supply chain and hike in inflation and exchange rate instability.

The adjusted coefficient of determination in this case is relatively low. The variables included could not substantially explain the variations in exchange rate pass-through as expected. While the probability F-statistics shows that the model is adequate, the Durbin-Watson value shows a low degree of auto-correlation.

Table 4.2.2 shows that all the variables have a long-term association supported by an F-statistics value higher than the top bound. Similar effects on currency rate pass-through are shown by the volatility, which includes the interplay between exchange rate and inflation dynamics, as they were in the short term model. It has been shown that all the variables have a long-term impact on exchange rate pass-through. The substantial error correction coefficient has the anticipated negative sign for the time period. It shows that about 64% disequilibrium error is corrected for, per year towards attaining a long run equilibrium condition.

Table 4.2.2: Regression Analysis Result on the Relationship between Exchange Rate Pass-Through and Inflation Rates in West Africa

SHORT-RUN			LONG-RUN				
Dep. Variable/ inf.	**Coeff.**	**Prob.**	**Std. Err**	**Dep. Variable/ inf.**	**Coeff.**	**Prob.**	**Std. Err.**
Inf(-1)	0.24***	0.00	0.1051	volatility	-0.00002***	0.00	0.0005
Inf(-2)	-0.03	0.53	0.0912	EXR	-0.27***	0.00	0.0017
INFL(-3)	0.1**	0.04	0.0833	EXRV	-0.005	0.45	0.0018
INF(-4)	0.06	0.22	0.0971	C	2.26***	0.00	
Volatility	-1E-05***	0.00	0.0088	R^2	0.39		
EXR	1.66***	0.00	0.0005	R^2 Adjusted	0.36		
EXR(-1)	-0.47	0.42	0.0071	Prob.(F-stat)	0.00***		
EXR(-2)	-0.49	0.4	0.0063	AIC	2.98		
EXR(-3)	-0.87**	0.03	0.0061	SIC	3.14		
C	1.44***	0.00		H-Q	3.05		
R^2	0.39			DW	1.96		
R^2 Adjusted	0.36			F-stat	19.76 >2.37 Upper bound		
Prob.(F-stat)	0			ECM	-0.64	0	
AIC	2.98						
SIC	3.14						
H-Q	3.05						
DW	1.96						

Source: Author's Computation with E-views

Note: Levels of significance are: ***p<0.10, ****p<0.05 and *****p<0.01 respectively.

4.3 Panel ARDL Estimation Results for Anglophone and Francophone West African countries.

Table 4.3 is the panel autoregressive distributed lag model estimated for the Anglophone and Francophone countries to evaluate the effect of exchange rate fluctuations on inflation rates and the role of monetary and fiscal policies on price stability using comparison of estimated results. In this sense, the study combines elements of fiscal and monetary policies, including public debt and value added tax, into the model. Monetary policy components include the currency supply. The Francophone countries chosen are Benin Republic, Burkina Faso, Cote d'Ivoire, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Senegal, and Togo. The Anglophone countries chosen are the Gambia, Ghana, Liberia, Nigeria, and Sierra Leone.

From the long-run estimated equation, monetary policy impacted significantly in Anglophone countries and insignificantly in Francophone countries but indicates negative relationship in both Anglophone and Francophone West African group of countries. By implication, increasing volume of credit into the economies of these countries reduces inflationary trend and thus maintain price stability in the long run. Increasing volume of credit would result in lower interest rate, increased in the aggregate level of investment and employment and, consequently aggregate demand. This may imply that such volume of credit in circulation was highly regulated during the period because it is expected that uncoordinated monetary policy may trigger price instability.

Increase in crude oil prices resulted in price stability during the period, based on the estimated results but significantly in the Anglophone countries. However, increase in oil prices trigger a corresponding increase in domestic commodities and price instability even within a short period. One observation here could be that, some countries within the Anglophone and Francophone exhibited actions that subdued lingering negative effects of crude oil prices.

Trade openness as shown reduced price instability as expected. Openness to trade among the Anglophone and Francophone increases the degree of globalization which ensures massive production and output increase. This ensures stability in the long run.

Economic growth rate triggers rising inflation as the results depict. Economic growth dynamics traditionally measures development. Such development would need to increase varying economic activities which subsequently increase price levels. In the results, a 1% increase in growth led to about 0.02% significant increase in inflation for the Anglophone countries while it led to about 0.08% significant increase within the Francophone countries. Instability was less pronounced in the Anglophone countries compared to the Francophone. However, this is not significant at the 5% level in both cases. Exchange rate coefficient gave negative values in both cases. This shows the significance of exchange rate particularly appreciation on price stability. Appreciation brings about price stability and general macroeconomic stability within the region.

Public debt variable negatively impacted on inflation in the Anglophone countries while it impacted positively on inflation in the Francophone countries. If increasing debt creates price stability, that is a pointer to the fact that such debt incurred was well utilized and directed to productive use. In Nigeria, just as some other developing countries, there are many episodes of mismanagement, corruption and unaccounted spending behaviours that trigger further underdevelopment, poverty and growth-drags. The results differ from the Francophone countries where public debt related positively with inflation. Thus, in this case public debt increase created price instability during the period for the Francophone countries. Value added tax impacted negatively on inflation in the long run in both Anglophone and Francophone countries. Consumption reduces with increasing tax levels and is expected to lower commodity prices.

Turning to the short run analysis, money supply in the short run positively impacted on inflation in the Anglophone countries while it impacted negatively on inflation in the Francophone countries. Thus, within the short run, price instability was more pronounced with increasing money supply within the Anglophone compared to the Francophone region. Crude oil prices increase shows a positive impact on inflation for each of the Anglophone and Francophone regions. In Nigeria just like any other country, an increase in the crude oil price leads to geometric rise in commodity prices within a very short period and this reduces welfare and consequently increases poverty. Oil price increase triggers inflation and hence macroeconomic instability within the domestic economy. However, the crude oil price is significant for the Francophone countries.

Trade openness came with positive coefficients in the two regions demonstrating increase in instability from increasing trade within the short run. In the short term, economic growth variable impacted negatively on inflation. This implies that a rise in the real growth could lead to price reduction and hence stabilize the economy. Monetary approach of inflation suggested that a rise in output results in demand for real money balance which makes the price level drop immediately. Similarly, a decrease in the interest rate could stimulate GDP growth rate, however, it devalues country currency and in the long run feeds inflation. Previous empirical evidence has suggested that improved macroeconomic performance will keep in check the inflation pressure in the longrun. The experience in developing nation has always been price escalation leading to worsening welfare condition and general low aggregate demand. In the short run, exchange rate appreciation increases inflation and hence instability, based on the short run analysis. This may be connected with other macroeconomic variables in disequilibrium within the economic system. Public debt impacted negatively on inflation within the short run. Thus, results show that rising public debt lowers inflation for the regions.

This may mean that resources are well diverted appropriately towards productive end. This is not very common in developing countries like Nigeria where debt increase means worsening economic conditions for the masses. The value added tax has opposite effect on inflation in each of the regions.

It has similar short-run and long-run effects on inflation in both the Anglophone region while the results were mixed for the Francophone. The reason for such mixed results in the Francophone may be connected to inconsistency in policy framework. Error correction coefficients in both Anglophone and Francophone countries are as expected with negative signs and are equally significant. However, higher percentage of disequilibrium conditions towards the long run were corrected for the Francophone countries compared to the Anglophone. Thus, speed of adjustment towards long-run equilibrium was higher for the Anglophone countries.

Table 4.3: Panel ARDL Estimation Results for Anglophone and Francophone West African Countries.

LONG RUN EQUATION(ANGLOPHONE)				**SHORT RUN EQUATION(ANGLOPHONE)**			
Variable	**Coeff.**	**Prob.**	**Std Err.**	**Variable**	**Coeff.**	**Prob.**	**Std. Err**
MSP	-0.07***	0.00	0.0493	MSP	0.02	0.35	0.0246
PPI	-0.61***	0.00	0.0261	PPI	0.28	0.17	0.0130
TROP	-0.32	0.16	0.0515	TROP	0.71**	0.05	0.0257
GDPGR	0.02***	0.00	0.1689	GDPGR	-0.05*	0.07	0.0844
EXR	-0.01	0.95	0.0005	EXR	0.41	0.39	0.0002
PD	-0.01	0.18	0.0248	PD	-0.001	0.77	0.0124
VAD	-0.01	0.85	0.1828	VAD	-0.22	0.18	0.0914
				C	3.49***	0.00	
				ECM	-0.85***	0.00	
				LOG LIKELIHOOD	-18.24***	0.00	
LONG RUN EQUATION(FRANCOPHONE)				**SHORT RUN EQUATION(FRANCOPHONE)**			
Variable	**Coeff.**	**Prob.**	**Std. Err**	**Variable**	**Coeff.**	**Prob.**	**Std .Err**
MSP	-0.001	0.87	0.0348	MSP	-0.05	0.65	0.1074
PPI	-0.14	0.18	0.0185	PPI	0.77**	0.02	0.0574
TROP	-0.30	0.24	0.0362	TROP	2.68**	0.03	0.1135
GDPGR	0.08***	0.01	0.1188	GDPGR	-0.03	0.81	0.3673
EXR	-0.43*	0.07	0.0033	EXR	1.02	0.39	0.0011
PD	0.0002	0.90	0.0174	PD	-0.02**	0.04	0.0543
VAD	-0.02	0.54	0.1286	VAD	0.04	0.71	0.3994
				C	5.90***	0.00	
				ECM	-1.44***	0.00	
				LOG LIKELIHOOD	-246.97	0.000	

Source: Author's Computation

Note: Levels of significance are: *****p<0.10, ******p<0.05 and *******p<0.01 respectively.

4.4 Panel NARDL Estimation Results of West African Countries

Table 4.4 below captures the possible asymmetric/nonlinear relationship between exchange rate fluctuations and inflation rates in West African region. The long-run coefficients of positive and negative exchange rate are 0.00 and 0.02 respectively. This implies that the coefficients of positive and negative exchange rate are positive. For a positive coefficient of exchange rate, it means a unit increase in exchange rate or depreciation will increase inflation by 0.00 percent. This means that policy implementation to depreciate currency or devaluation will ultimately feed inflation in the longrun meanwhile the situation is different in the shortrun as the coefficient shows -0.02. This means a unit increase in exchange rate or positive trends will reduce inflation in the shortrun. Therefore, the position to further devalue currency will only be beneficial in the shortrun and become harmful in the longrun.

Furthermore, the coefficient is attached with decline or appreciative exchange rates are 0.02 in the long run and -0.11 in the shortrun. This implies that a unit increase in exchange rate appreciation or negative values will increase inflation by 0.02 percent in the long run but in the shortrun, inflation will be decreased by 11percent. The same outcomes discovered by (Laryea & Sumaila, 2001; Loening et al., 2009, Nigusse et al. 2019, Kayamo, 2021).On the other hand, it was also indicated from the table that money supply posited a negative and significant relationship with inflation. It was observed that a unit increase in money will cause 0.08 unit decrease in inflation in the longrun but revealed that the relationship was positive in the shortrun at the 17percent elasticity. This connotes that an increase in money supply in the shortrun will feed inflation by 17percent. Also, the idea of monetary approach to reduce inflation through monetary tools and increase the value of currency holds in this result. It was revealed that a percentage increase in interest rate by monetary authorities of West African countries will attract foreign investors and

demand for local currency will increase which in turn reduce inflationary pressures and cut excessive spending in the circulation. Meanwhile, the degree of changes remains relatively close because a unit increase in interest rate will reduce inflation by 57% and 56% both in the long-run and short-run respectively. This evidenced in different empirical studies in the literature and confirms the idea of monetary approach in managing inflationary pressures.

In the longrun, it was shown that GDP growth rate is negatively related to inflation rate which connotes that a unit increase in growth rate will reduce inflation by 15%. Both the monetarist and Keynes argued that growth rate is accompanied by high inflation in the shortrun but purge it away in the longrun. This is evidenced in this study as GDP growth rate indicated a positive relationship with inflation because it pushes workers to demand for more money but in the longrun, inflation will be reduced significantly by 15% because relatively all workers will invest their excess funds into high interest rate asset. As proven in other literature, that volatility and instability in exchange rate contribute immensely to the recent inflationary pressure in many developing countries of the world especially the import dependent countries like West African region.

Table 4.4 Panel NARDL Estimation Results for West African Countries

	Long Run Equation					**Short Run Equation**		
	Coeff.	P-value	Std. Err			Coeff.	P-value	Std. Err
Variable				Remarks	COINTEQ01	0.86***	0.00	0.1872
EXR_POS	0.00	0.24	0.0009	Insig.	D(EXR_POS)	-0.02	0.71	0.0471
EXR_NEG	0.02***	0.00	0.0038	Sig.	D(EXR_NEG)	-0.11	0.31	0.1081
MSP	-0.08***	0.00	0.0013	Sig.	D(MSP)	0.17	0.55	0.2739
INR	-0.57***	0.00	0.0469	Sig.	D(INR)	-0.56***	0.00	0.1332
GDPGR	-0.15***	0.00	0.0261	Sig.	D(GDPGR)	0.01	0.89	0.0899
EXRV	0.00**	0.04	0.0004	Sig.	D(EXRV)	0.01*	0.06	0.0074
					C	-13.87***	0.00	

Source: Author's Computation

Note: Insig. stands for Insignificant, while **Sig.** stands for Significant.

Note: Levels of significance are: *****p<0.10, ******p<0.05 and *******p<0.01 respectively.

Figure 4.1 shows the graph of AR inverse root of the model. The graph below shows all the polynomial roots as captured within the unit circle. This connotes that the model is stable and reliable.

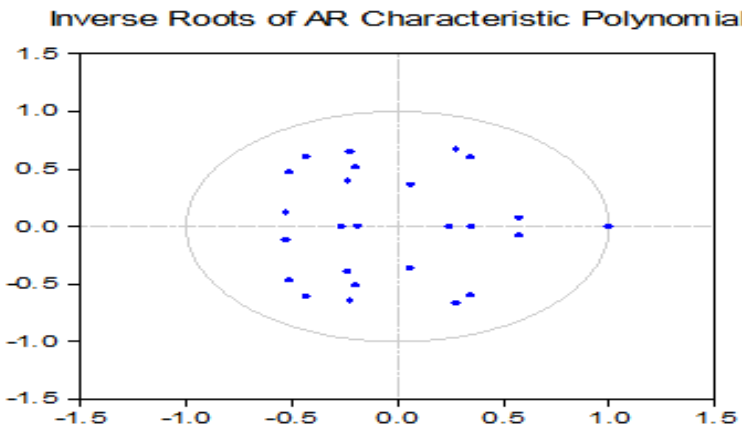


Figure 4.1 Inverse Roots

In order to check for the stability of the model, the study adopted the proposed CUSUM test by Borensztein et al. (1998). Figure 4.2 indicates that the estimated line falls within the 5percent level of significance. This means that the model is reliable and stable for the period under study.

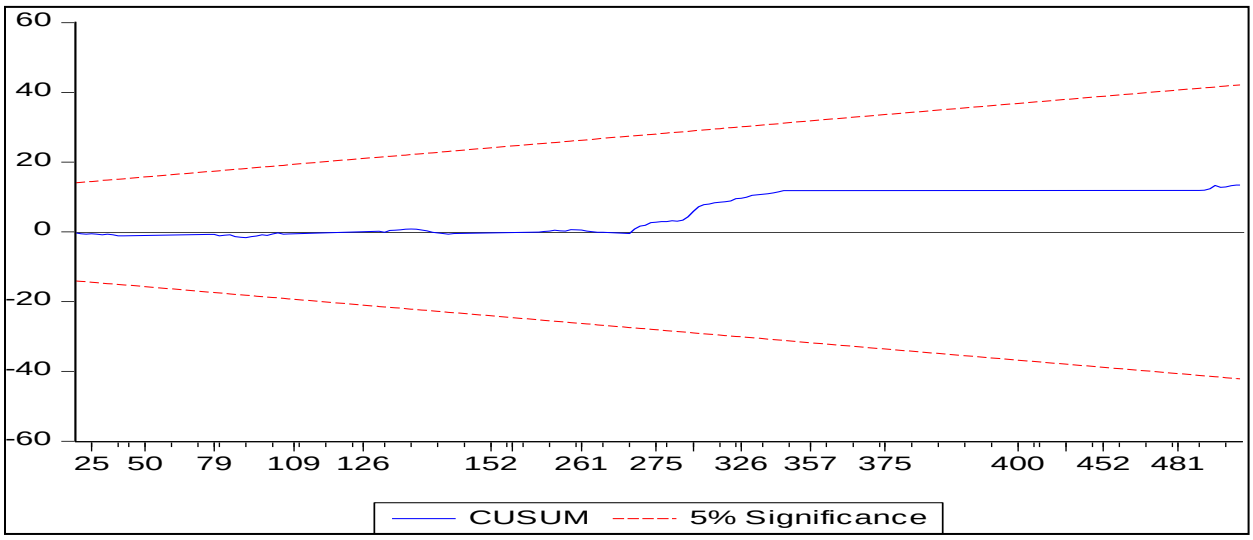


Fig.4.2 Stability CUSUM Test

4.5 Discussion

This study was carried out to investigate the relationship between exchange rate fluctuations and inflation rates in West African region from 1990 to 2020, covering fifteen West African countries in the short run and long run. The study formulated three measurable objectives and hypotheses. The model was decomposed into monetary and fiscal approach to measure the contributing factors other than money supply to inflation in West Africa region. Also, the countries were subdivided into Anglophone and Francophone group of countries to measure differential relationship between the categorized countries. In the objective one, it was observed that the dynamism of the model allows for the inclusion of previous effect of inflation on the recent level in the region. In the short run, the major problem of inflation is the spill-over effect of preceding years which contributes largely to inflation level in the region. For instance, it was shown that an increase in the percentage of inflation rate in lag 4, 3, 2, and 1, will increase the current inflation rate by 7%, 33%, 11% and 26 % respectively. This connotes that the past period of inflation and growing economic activity is feeding current global inflation witnessed in West African countries. This result coincides and agrees with Capistrano and Francia (2006); Monfared and Akin (2017) and Choudhry &Hakura (2001) that reported with the use of 71 developed and developing countries in their study; showing that lagged inflation rate positively influence the rate of inflation in a country. The result explains the theoretical understanding that actual inflation is a result of expected and anticipated inflation.

Also, the result further revealed that exchange rate volatility that measures the movement of the rate of exchange of one country against other positively influence the level of inflation in the region. This means that a unit increases in exchange rate will increase price instability by 0.005 percent in the short-run. This is an indication that floating exchange rate regime practiced in the West African countries contributes to the high cost of intermediate goods and spread to the price

of products as the case may be. Meanwhile, the lag 1 coefficient of exchange rate volatility shows negative signs, which means a unit increase in the rate of exchange rate volatility of the previous year, will reduce price level. It means when volatility in exchange rate is not permanent for stay for longer period, it may not be transmitted into price changes in domestic market. The notable previous study that agreed with our findings is Monfared & Akin, 2017; and Buabeng, Ayesu, & Adebor, 2019; that reported a negative relationship between first lag of exchange rate with inflation. It was shown in short-run model of objective one that balance of payment is negatively related to inflation in the region. This means that an increase in the balance of payment is capable of reducing inflation by 2 percent. The inclusion of balance of payment was justified on the premise that globalization has led to the transfers of inflation of exporting countries into other importing nations. It means that the more an economy is opened to other countries of the world, the more the chances of being affected by the economic situation of those countries. The relationship between balance of payments and inflation is not direct, but it has direct nexus with exchange rate.

The relationship between economic growth and inflation is dicey and remains undetermined. In our model, the rate of economic growth was considered to measure economic growth and the results revealed that gdpgr has a negative relationship in the short-run. This means that for every unit increase in gdpgr, there will be a corresponding decline of about 2% in inflation rate in the short-run. Meanwhile, the coefficient value of the long-run equation indicates 39% decrease in inflation if a unit increases in growth rate persists. In theory, it was assumed that certain threshold of inflation is beneficial to economic growth. This indicates that productivity in the economy is influenced by the level of inflation rate, however, when it rises above a certain degree or say specifically above single digit, the economy starts facing hardship and concurrently leads to high

unemployment rate. Our result is an indication that if economy is persistently growing at 1percent, the price instability could be controlled and inflation will be reduced by 2 percent. In comparison, the result of this current study is agreed with the findings of Nell, 2000; Pollini and Zhu, 2005; Frimpong and Oteng-Abayie, 2010. Meanwhile, this result contradicts the positive relationship found in Dornbush (1987), where it was revealed that growth has a positive relationship with inflation. The study considered the lag value of growth rate and the result indicated that a unit increase in lag 1 and 2 of growth rate will reduce inflation by 5% and 3% respectively in the short-run.

The coefficient of interest rate in the exchange rate and inflation nexus model revealed a negative sign both in the short –run and long –run. This means that a percentage increase in interest rate will reduce inflation by 4 percent both in the short-run and long-run. This is a confirmation of monetary theories to use various monetary tools to reduce inflation caused by expansionary monetary policies. The degree at which exchange rate variation is transmitted to price instability has been identified and confirmed in this study. This result corroborates with the work of De Mello and Moccero (2008), but contradicts the report of Fatukasi (2010). The link between producer price index and inflation is important because it measures the rate of price changes in the economy. Exchange rate variations pass through two main channels into domestic prices through import prices and when exchange rate policies by monetary authorties are depreciated. It was revealed in the short-run model that producer price index has a negative relationship with inflation which means that a unit increase in cost of raw materials will reduce inflation rate by 0.1%. However, the previous or past producer price index is consistent with an increase in inflation rate by 1% in the short-run.

This could be explained that prices only responded to the past shocks of producer prices. Bhundia, (2002) agreed that hike in demand for domestic goods as a result of devaluation of currency further put pressures on domestic prices. This finding is consistent with the report of Cushing and McGarvey, 1990 that suggested a positive relationship between cost of production in terms of producer price index and inflation. In the long-run it maintains a positive relationship but the magnitude of the influence changes to 4%. This has equally been explained by the study of Gao, An Zheng (2013) Özpolat, (2019).

On the second objective, the measurement of exchange rate pass-through and its impact on inflation was examined. It was revealed in the model that past records of inflation rate in about 1 year indicates a positive link with current inflation rate through exchange rate volatility. This means a percentage increase in past record of inflation rate by lag 1,3, and 4, the corresponding current inflation will increase by 24%, 10% and 6% respectively while the lag 2 was found to be negatively related to inflation rate in the current year within the region in the short-run. Also, the findings in the long-run revealed that volatility, exchange rate volatility and exchange rate have a negative link with inflation. This could be inferred that a unit increase in volatility, exchange rate volatility, and exchange rate will decrease inflation by 0. 002%, 27%, and 5% respectively in the long-run. Manuel, and Goldberg (2004); Jiang, and Kim, (2013) and Oyinlola, (2010) reported the same results in their individual study. It was shown that the convergence of long-run disequilibrium will be corrected at a speed of adjustment of 64% yearly.

On the objective three, the fiscal and monetary role was considered to provide new verification in relation to the previous results. In theory, the classical thoughts through their quantity theory of money concluded that persistent fiscal deficits and financing through debt is a major cause of

inflation in a country. In our study, we subdivided West African countries into two major cultures such as French speaking countries (Francophone), and English speaking countries (Anglophone). In the long-run model, it was revealed that all the variables behave negatively to inflation rate in Anglophone countries except for growth rate. However, in the short-run all the regressands were found to be positively related to inflation level in the region within the period of review and sample time except for growth rate, value added and public debt. It was established that disequilibrium in the model will be corrected in a speed of adjustment of 64%. In the francophone model, it was revealed that all the variables have a negative relationship with inflation rate in sub-region of West African countries but growth rate and public debt were found to positively influence inflation rate in the region in the long-run. Also, it was ascertained in the short-run model that all the variables included in the model posited a negative link to inflation rate. However, producer price index, exchange rate and value added depict a positive connection with inflation within the period of review. Meanwhile, the speed of adjustment is very high to correct long-run disequilibrium within a short-period of time.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this study, three models were considered for examining the relationship between exchange rate fluctuations and inflation rates in West African countries. The study relied on annualized data for analysis in the study. The use of ARDL helped to predict the behavior of each variable in the model both in long time and short time horizon for the period of 31years from 1990 to 2020. The study, based on the model in objective one, provided strong relationship between exchange rate and inflation rate in West African countries. This is verified by the level of significance of variables in the model during the period under review. For instance, it was shown that inflation rate in past periods 1 and 3, and producer price index in past period 1 were found to be positively significant to influence inflation rate. Whereas, inflation lagged in periods 2 and 4, and exchange rate volatility in period 2 were found to be positively related but were statistically significant in the model. Also, exchange rate volatility lagged in first period was found to be statistically significant but with a negative relationship. Meanwhile, balance of payment, and gross domestic product growth rate in past periods 1 and 2; and producer price index had negative relationship and statistically insignificant during a short period of time. Also, in the long run, producer price index had positive relationship with inflation rate but statistically insignificant; whereas, exchange rate volatility, balance of payment, gross domestic product growth rate and interest rate recorded a negative relationship and are statistically insignificant to influence inflation rate in the region.

In objective two, the model indicated that inflation lagged 1 and 3, and exchange rate had a positive significance to influence inflation in the short-run, while inflation rate in its past period 4, was found to be positive but statistically insignificant. Also, volatility, and exchange rate in past period

3 were found to be negatively significant to influence inflation rate in the region. Inflation rate in past period 2, exchange rate in past period 1, and exchange rate in past period 2 had negative relationships which were found to be statistically insignificant in the short run. In the long run, volatility and exchange rate had negative but significant relationship on inflation while exchange rate volatility has negative but insignificant relationship on inflation in the period under review.

The justification to examine objective three is to ascertain the differential role played by monetary authorities and fiscal imbalances in both francophone and Anglophone countries. The result of the long run model in Anglophone is evidenced as follows:

i. It was observed that in the long-run model, gross domestic product growth rate positively related to inflation rate and was statistically significant while money supply and producer price index were found to be negatively significant.

ii. It was further shown that trade openness; exchange rate, public debt and value added were statistically insignificant to measure the impact of inflation rate in the region.

In the short-run, it was discovered that trade openness had a positive relationship and was statistically significant while money supply, producer price index and exchange rate were positive but insignificant to explain the rate of inflation in the model.

Also, gross domestic product growth rate, public debt and value added were statistically insignificant and negatively related to inflation in the short-run. For francophone countries, the model revealed that gross domestic product growth rate positively related to inflation; and was statistically significant in the long-run, whereas public debt was found to be positively related but not significant to explain inflation rate in the region.

Further, it was shown that money supply, producer price index, trade openness, exchange rate, and value added were found to be statistically insignificant and negatively related to inflation rate in

the long-run. However, the result of the short-run model in francophone countries depicts that producer price index and trade openness had a significant impact on inflation rate and showed a positive sign. The public debt result showed that it was statistically significant but with a negative relationship. Regrettably, exchange rate and value added were positively related but statistically insignificant; while money supply and gross domestic product growth rate negatively influenced inflation and had no significant impact on inflation in the region for the period under review.

5.2 Recommendations

The Policy implications of this study rest squarely on the findings derived from the estimated models. It is clearly seen in this study that inflation rate remains an economic phenomenon. Below are the recommendations based on the findings from this study:

i). The policy makers, government and monetary authorities must ensure that price stability is restored. Since it has been discovered through previous review and this current study that exchange rate regime, especially floating regime, imposes significant costs on production activities of producers, it is therefore, incumbent on monetary authorities to ameliorate this adverse effect and review devaluation policy implemented in different West African countries.

ii). The theoretical opinion that exchange rate volatility is directly leading to price instability is strongly upheld in this study. It was observed that volatility was from the resultant effect of floating exchange rate regime which is not supported by high exportation. It is therefore recommended in this study that maintenance of floating exchange rate regime should be supported with high productivity, and government should ease up the process and provide direct supply chains for farm produce to be exported without damaging the consumption level of the domestic economy.

iii). The growth of money is found to reflect the existing theoretical argument and its direct influence on inflation and price level. It is therefore, important for the monetary authorities to employ the tool of increase in interest rate to reduce the lending of the formal financial sector; which will in turn reduce the amount of money in circulation.

iv). While the above recommendation could cause policy contraction because an increase in interest rate will reduce the level of productivity in the economy, the policy maker is expected to maintain single digit of inflation rate; while interest rate should be increased within a minimal rate above inflation rate to reasonably maintain price stability and enhance productivity.

v). It is quite evident that the existence of globalization through balance of payment and trade openness has provided the incidence of imported inflation into African countries. This is the main reason why the governments in West African countries should embrace strong economic integration and establish single currency in order to eliminate negative influence of balance of payment and trade openness in the region.

vi). The spillover effect of exchange rate and inflation rate in inflation environment model indicated that commodity prices will be hugely affected. Therefore, the study recommends that ineffective exchange rate policy should be reversed within a reasonable period of time.

vii). The inflation dynamics was found to be another significant factor causing high inflation in the region as evidenced by this current study. It is then understood that the factor associated with high inflation is mainly cost-push such as raw materials prices, labour cost and oil prices. Since they are found to be significant to explain inflation dynamics, it is expected that subsidy or concessions should be provided for the manufacturing companies so as to reduce the cost of production and thereby leads to reduction in prices of goods.

viii). As majority of the households in West African region expend the largest percentage of their incomes on consumption such as foods and shelter, governments within these regions should intervene in the market activities to trim down food prices and protect the vulnerable consumers.

ix). Since interest rate, exchange rate and money supply, being the most important explanatory variables used in this study, react differently in different sub-regions, the study recommends that careful implementation of policy should be undertaken in order to reduce price instability resulting from the behavior and performance of these three variables.

x). The study established strong evidence that monetary and fiscal policy play a significant role as the causes of inflation in West African region. The contribution of money supply in francophone was found to be negative but positive in Anglophone. It is obvious that the money growth is less important to influence inflation in francophone countries than Anglophone. It is therefore, expected that the monetary authorities in Anglophone countries should embrace policies that will keep inflation at bay.

5.3. Contribution to knowledge

This study has contributed to knowledge in the area of scope by considering West African countries as the area of focus; and further reclassifies into Francophone and Anglophone group of West African countries, to examine the differential effect of exchange rate fluctuations on inflation rates in each of these group of countries. The study by extension also improves on the range of years from 1990 to 2020 which covers a 31-year period, and extends the discussion of concepts to 2022 and the recent happenings in the world regarding inflation rate.

Furthermore, the results of the Anglophone and Francophone provided additional evidence on the relationship between exchange rate fluctuations and inflation in West African countries. Money

supply contributed to inflation issues in Anglophone countries as indicated in the result but the same is not obtainable in the francophone countries.

This study also contributes to the existing knowledge by assuming that money supply is not in absolutism the contributor to inflation but exchange rate depreciation or devaluation is taking the center stage in the determination of price instability especially in import dependent countries.

It is assumed in the inflation theories that growth rate in the economy could contribute to inflation rate, however, the assumption does not specify the whether the influence is in the short run or long run. Hence, it is evidenced in this study that growth rate can only contribute to high inflation rate of Anglophone and Francophone countries in the long run.

Another significant contribution to knowledge is on the responses of inflation rate to exchange rate movement in the West African region. It was discovered that positive exchange rate (currency appreciation) will bring down inflation in the entire region.

There is huge gap in the literature regarding the findings in the West Africa region which this study has bridged by providing adequate estimates in respect of inflation rate's response to exchange rate in the presence of money supply, interest rate, economic growth rate, producer price index, public debt, value added and trade openness using ARDL method.

This study also contributes to knowledge by allowing four lags for inflation in order to predict correctly the source of inflation in this region. This means that previous high inflation from fourth year still contributed to the current inflation experienced in the region.

In this study, ARDL model was considered as the best technique to measure the short and long time horizons above the GMM and OLS, despite their superiority in the class of estimation

techniques. ARDL provides adequate information and findings to ease up the decision of policy makers regarding inflation rate management.

5.4 Suggestions for further studies

There is no doubt that conducting this research work is faced with few constraints which have actually served as limitations in one way or the other. Therefore, there are still other gray areas to be investigated by other researchers in the nearest future.

Because the current study has looked on the interaction between exchange rate fluctuations and inflation rates in West African countries; and adequate findings have been revealed. It is expected that future researchers should look into this same research problem in other regions such as North Africa and East Africa, because it was discovered during the review that studies in this area are very limited.

i). It was also revealed in this current study that fisher's assumption on money supply and inflation rate does not hold in West African region. Therefore, the re-estimation of theoretical arguments should be undertaken by future researchers for adoption of new theory and development of new models.

ii). As this current study failed to consider the interaction of monetary policy in reducing inflation rate in the region; it becomes pertinent for future researchers to have a cursory look on the reduction of inflation rate through monetary policy.

iii). There should be a comparative analysis of various estimation techniques in future studies to measure the best model to be adopted in the West African region.

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APPENDIX I

Null Hypothesis: Unit root (individual unit root process)
Series: BOP1
Date: 07/14/22 Time: 16:40
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 298
Cross-sections included: 16 (1 dropped)

Method	Statistic	Prob.**
ADF - Fisher Chi-square	63.0778	0.0009
ADF - Choi Z-stat	-2.78352	0.0027

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: BOP1
Date: 07/14/22 Time: 16:41
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 326
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	101.944	0.0000
PP - Choi Z-stat	-5.20141	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: EXR1
Date: 07/14/22 Time: 16:42
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 459
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	67.1702	0.0006
ADF - Choi Z-stat	-2.71133	0.0034

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: EXR1

Date: 07/14/22 Time: 16:43
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 477
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	62.9067	0.0019
PP - Choi Z-stat	-1.99631	0.0230

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: GDPGR1
Date: 07/14/22 Time: 16:44
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 451
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	121.851	0.0000
ADF - Choi Z-stat	-7.01180	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: GDPGR1
Date: 07/14/22 Time: 16:44
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 468
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	249.796	0.0000
PP - Choi Z-stat	-11.8896	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(GSP1)
Date: 07/14/22 Time: 16:49
Sample: 1 496
Exogenous variables: Individual effects

User-specified lags: 1
Total number of observations: 395
Cross-sections included: 15 (2 dropped)

Method	Statistic	Prob.**
ADF - Fisher Chi-square	211.607	0.0000
ADF - Choi Z-stat	-11.9168	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: GSP1
Date: 07/14/22 Time: 16:49
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 431
Cross-sections included: 16 (1 dropped)

Method	Statistic	Prob.**
PP - Fisher Chi-square	65.1277	0.0005
PP - Choi Z-stat	-3.89890	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: INF1
Date: 07/14/22 Time: 16:50
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 411
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	108.802	0.0000
ADF - Choi Z-stat	-6.16345	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: INF1
Date: 07/14/22 Time: 16:50
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 428
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	144.513	0.0000
PP - Choi Z-stat	-8.35698	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: INR1
Date: 07/14/22 Time: 16:51
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 239
Cross-sections included: 16 (1 dropped)

Method	Statistic	Prob.**
ADF - Fisher Chi-square	155.355	0.0000
ADF - Choi Z-stat	-7.73943	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: INR1
Date: 07/14/22 Time: 16:52
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 256
Cross-sections included: 16 (1 dropped)

Method	Statistic	Prob.**
PP - Fisher Chi-square	123.014	0.0000
PP - Choi Z-stat	-7.11845	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(MSP1)
Date: 07/14/22 Time: 16:53
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 407
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	154.220	0.0000
ADF - Choi Z-stat	-9.06793	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(MSP1)
Date: 07/14/22 Time: 16:54
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 426
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	301.045	0.0000
PP - Choi Z-stat	-14.4029	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(PD1)
Date: 07/14/22 Time: 16:55
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 435
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	114.331	0.0000
ADF - Choi Z-stat	-6.90091	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(PD1)
Date: 07/14/22 Time: 16:56
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 452
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	255.465	0.0000
PP - Choi Z-stat	-13.0662	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(PPI1)
Date: 07/14/22 Time: 16:57
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 445
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	212.974	0.0000
ADF - Choi Z-stat	-11.9064	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(PPI1)
Date: 07/14/22 Time: 16:58
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 462
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	191.836	0.0000
PP - Choi Z-stat	-10.7519	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: TROP1
Date: 07/14/22 Time: 16:59
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 432
Cross-sections included: 16 (1 dropped)

Method	Statistic	Prob.**
ADF - Fisher Chi-square	43.1254	0.0906
ADF - Choi Z-stat	-1.95193	0.0255

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: TROP1
Date: 07/14/22 Time: 16:59
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 448
Cross-sections included: 16 (1 dropped)

Method	Statistic	Prob.**
PP - Fisher Chi-square	80.4432	0.0000
PP - Choi Z-stat	-3.72391	0.0001

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(UEMP1)
Date: 07/14/22 Time: 17:01
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 429
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	82.5700	0.0000
ADF - Choi Z-stat	-3.12110	0.0009

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(UEMP1)
Date: 07/14/22 Time: 17:02
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 446
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	136.311	0.0000
PP - Choi Z-stat	-5.89778	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(VAD1)
Date: 07/14/22 Time: 17:03
Sample: 1 496
Exogenous variables: Individual effects
User-specified lags: 1
Total number of observations: 392
Cross-sections included: 17

Method	Statistic	Prob.**
ADF - Fisher Chi-square	136.663	0.0000
ADF - Choi Z-stat	-8.20380	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Null Hypothesis: Unit root (individual unit root process)
Series: D(VAD1)
Date: 07/14/22 Time: 17:03
Sample: 1 496
Exogenous variables: Individual effects
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 410
Cross-sections included: 17

Method	Statistic	Prob.**
PP - Fisher Chi-square	269.214	0.0000
PP - Choi Z-stat	-13.1744	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Dependent Variable: INF1
Method: ARDL
Date: 07/14/22 Time: 18:13
Sample: 1 496
Included observations: 158
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): EXRV1 BOP1 GDPGR1 INR1 DPPI1
Fixed regressors: C
Number of models evaluated: 12500
Selected Model: ARDL(4, 2, 0, 2, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF1(-1)	0.257829	0.083935	3.071770	0.0026
INF1(-2)	0.107724	0.076899	1.400847	0.1634
INF1(-3)	0.334922	0.069354	4.829142	0.0000
INF1(-4)	0.072242	0.083351	0.866728	0.3876
EXRV1	-5.09E-05	9.18E-05	-0.554926	0.5798

EXRV1(-1)	-0.015559	0.006999	-2.222934	0.0278
EXRV1(-2)	0.004205	0.006150	0.683681	0.4953
BOP1	-0.014738	0.044100	-0.334200	0.7387
GDPGR1	-0.017520	0.028286	-0.619374	0.5367
GDPGR1(-1)	-0.045415	0.031730	-1.431294	0.1545
GDPGR1(-2)	-0.025150	0.031683	-0.793796	0.4286
INR1	-0.036820	0.019842	-1.855629	0.0656
INR1(-1)	0.035996	0.019725	1.824858	0.0701
DPPI1	-0.001282	0.004364	-0.293659	0.7694
DPPI1(-1)	0.009662	0.004404	2.193951	0.0299
C	1.018217	0.812823	1.252692	0.2124

R-squared	0.485555	Mean dependent var	0.899808
Adjusted R-squared	0.431212	S.D. dependent var	1.135609
S.E. of regression	0.856454	Akaike info criterion	2.623730
Sum squared resid	104.1588	Schwarz criterion	2.933867
Log likelihood	-191.2747	Hannan-Quinn criter.	2.749681
F-statistic	8.935039	Durbin-Watson stat	2.186119
Prob(F-statistic)	0.000000		

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

ARDL Long Run Form and Bounds Test
Dependent Variable: D(INF1)
Selected Model: ARDL(4, 2, 0, 2, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 07/14/22 Time: 18:14
Sample: 1 496
Included observations: 158

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.018217	0.812823	1.252692	0.2124
INF1(-1)*	-0.227284	0.097186	-2.338653	0.0207
EXRV1(-1)	-0.011405	0.008886	-1.283391	0.2014
BOP1**	-0.014738	0.044100	-0.334200	0.7387
GDPGR1(-1)	-0.088084	0.054533	-1.615250	0.1085
INR1(-1)	-0.000824	0.028253	-0.029161	0.9768
DPPI1(-1)	0.008381	0.003102	2.701490	0.0077
D(INF1(-1))	-0.514888	0.105132	-4.897522	0.0000
D(INF1(-2))	-0.407164	0.091236	-4.462755	0.0000
D(INF1(-3))	-0.072242	0.083351	-0.866728	0.3876
D(EXRV1)	-5.09E-05	9.18E-05	-0.554926	0.5798
D(EXRV1(-1))	-0.004205	0.006150	-0.683681	0.4953
D(GDPGR1)	-0.017520	0.028286	-0.619374	0.5367
D(GDPGR1(-1))	0.025150	0.031683	0.793796	0.4286
D(INR1)	-0.036820	0.019842	-1.855629	0.0656
D(DPPI1)	-0.001282	0.004364	-0.293659	0.7694

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXRV1	-0.050178	0.051675	-0.971038	0.3332
BOP1	-0.064846	0.191895	-0.337923	0.7359
GDPGR1	-0.387549	0.282885	-1.369988	0.1729
INR1	-0.003625	0.124219	-0.029182	0.9768
DPPI1	0.036874	0.019828	1.859704	0.0650
C	4.479941	3.467529	1.291969	0.1985

EC = INF1 - (-0.0502*EXRV1 -0.0648*BOP1 -0.3875*GDPGR1 -0.0036*INR1
+ 0.0369*DPPI1 + 4.4799)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.226369	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
			Finite Sample:	
Actual Sample Size	158		n=80	
		10%	2.303	3.154
		5%	2.55	3.606
		1%	3.351	4.587

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.100701	Prob. F(2,140)	0.1262
Obs*R-squared	4.603433	Prob. Chi-Square(2)	0.1001

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/14/22 Time: 18:15
Sample: 1 496
Included observations: 158
Pre-sample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF1(-1)	0.318836	0.179669	1.774571	0.0781
INF1(-2)	-0.041127	0.110400	-0.372525	0.7101
INF1(-3)	-0.015420	0.070853	-0.217631	0.8280
INF1(-4)	-0.120836	0.101192	-1.194135	0.2344
EXRV1	4.26E-06	9.12E-05	0.046747	0.9628
EXRV1(-1)	0.000864	0.007098	0.121697	0.9033
EXRV1(-2)	0.002965	0.006350	0.466966	0.6413
BOP1	0.010240	0.044365	0.230806	0.8178
GDPGR1	-0.006641	0.028293	-0.234716	0.8148
GDPGR1(-1)	0.007501	0.032127	0.233479	0.8157
GDPGR1(-2)	0.008821	0.031735	0.277965	0.7814
INR1	0.000154	0.019694	0.007798	0.9938
INR1(-1)	0.008187	0.020014	0.409069	0.6831
DPPI1	0.000908	0.004353	0.208627	0.8350
DPPI1(-1)	-0.003650	0.004722	-0.773042	0.4408
C	-0.513835	0.847891	-0.606016	0.5455
RESID(-1)	-0.404816	0.199362	-2.030552	0.0442
RESID(-2)	-0.094759	0.149959	-0.631901	0.5285

R-squared	0.029136	Mean dependent var	-4.22E-18
Adjusted R-squared	-0.088755	S.D. dependent var	0.814513
S.E. of regression	0.849891	Akaike info criterion	2.619478
Sum squared resid	101.1241	Schwarz criterion	2.968382
Log likelihood	-188.9388	Hannan-Quinn criter.	2.761172
F-statistic	0.247141	Durbin-Watson stat	2.018705
Prob(F-statistic)	0.999083		

Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.118899	Prob. F(15,142)	0.3448
Obs*R-squared	16.70067	Prob. Chi-Square(15)	0.3371
Scaled explained SS	32.21594	Prob. Chi-Square(15)	0.0060