



An Econometric Analysis of the Effect of Exchange Rate on Inflation in Nigeria (1970 – 2014)

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ABSTRACT

This study examined the effect of exchange rate on inflation in Nigeria using annual data from 1970 to 2014, obtained from the Central Bank of Nigeria. This is because inflation has remained unabated in spite of all exchange rate measures that have been adopted by the monetary authority. In this regard, the main objective of this work is to investigate the extent to which exchange rate impact on inflation in Nigeria. Therefore, the multiple regression method was adopted. The unit root and Johansen co-integration tests were used to test for the stationarity and cointegration respectively of the variables (inflation, money supply, exchange rate, real gross domestic product and import prices). Consequently, the findings from this research show that inflation was responsive to lagged inflation, exchange rate, money supply and import prices at 5% significance level. Thus, this study concludes that exchange rate is a veritable tool to manage inflation in the country; therefore, the Central Bank of Nigeria should use policies that have direct effect on inflation as policy measures in combination with an exchange rate policy to check inflation movement in the country, especially policies on monetary growth and import management in order to manage inflation. In addition, exchange rate management policies can also be used to support other macroeconomic policies.

Keywords: Exchange Rate, Inflation, Money Supply and Monetary Policy

1.0 INTRODUCTION

Inflation is one of the major economic problems affecting so many economies of the world. Therefore, one of the main objectives of monetary policy in any economy is to maintain price stability. In Nigeria, the Central Bank of Nigeria is saddled with the responsibility of achieving this macroeconomic objective. The bank can do this through exchange rate channel. In the words of Owolabi and Adegbite (2014) the exchange Rate is one of the intermediate policy variables through which monetary policy is transmitted to the larger economy through its impact on the value of domestic currency, domestic inflation (the pass-through effect), the external sector, macroeconomic credibility, capital flows, and financial stability.

However, since the collapse of Bretton Woods of fixed exchange rate in March, 1973, Nigeria like most emerging countries adopted the floating exchange rate system, that allows market forces to determine the exchange rate. This adopted exchange rate regime has led to exchange rate volatility in the country. As noted by Ajibola et al (2015), the policy of free float led to significant real and nominal exchange rate volatility, with its attendant effects on investments, output and social welfare. To this end, the Central Bank of Nigeria since the adoption of the floating exchange rate regime has initiated several exchange

rate policies to stabilize it. Each policy introduced has its own priority objectives which were mainly to maintain price and macroeconomic stability. In the same vein, Adesoye (2012) stated that an exchange rate policy in Nigeria typically reflects priority being given to the anti-inflation objective, the purpose being to minimize the impact of imported inflation and to provide a signal for policy and commitment to low inflation and macroeconomics stability objectives.

Nevertheless, the trend of exchange rate management policies introduced since Nigeria's independence include, fixed exchange rate management regime of 1960 to 1985. The objectives of exchange rate then were, first, to preserve the external reserve of the country. The second is to maintain an equal balance of payments, and, finally, to uphold a stable exchange rate. During this period the naira was pegged to the British pound sterling until the pound was devalued in 1967. Following the devaluation of the pound, it was pegged to the United States of America dollar. Also, the fixed exchange rate regime brought about the over-valuation of naira which led to heavily reliance on imports and this affected the balance of payment position of the country. The major defect of the exchange rate system was that the overall objective of the regime was not geared towards long term development of the country.

Also, the total deregulation of the economy following the adoption of Structural Adjustment Programme (SAP) in July, 1986 and the need to float the naira in order to be determined by market forces led to the introduction of second-tier foreign exchange market in September, 1986. The policy was expected to bring about a realistic exchange of naira that will still stimulate non-oil sector and discourage the importation of finished goods and services. The mechanism of the second-tier foreign exchange rate market adopted dual exchange rate system, the official first-tier exchange rate and the free exchange market rate. The first-tier exchange rate was administratively fixed for official transaction, such as debt servicing, international payments and obligations. The free exchange market rate was determined by market forces of demand and supply, and used for transactions that were not official. However, the second-tier foreign exchange method was discredited because of the players encouraged multiple bidding, thereby defeating the idea of achieving a realistic exchange rate for the naira.

Similarly, The Dutch-Auction system of exchange rate management was introduced in April, 1987 as result of noticeable widening gap between the official and parallel exchange rate, including excessive demand for foreign exchange. The main objectives of this policy were to prevent high bids in the foreign exchange market and also provide the needed platform for professionalism in the market. Under this system, the market rate for the exchange rate was determined through auction. The authorized dealers in foreign exchange bid for foreign currency and they pay based on their bid rates. At any rate, this method failed to achieve the main reason for adopting it. The naira depreciated astronomically within this period. Equally, the foreign exchange market was introduced in July, 1987. This policy brought about the unification of the first and second tier markets, thereby leading to a unified exchange rate market system. The first-tier market was abolished from the market. Within the system of foreign exchange market two constituents were created. The first was official exchange market and, second, the autonomous foreign exchange market. The main objective of the second part of the foreign exchange market was to make it competitive with the parallel market in order to attract private businesses and investors. Nonetheless, the whole idea failed due to high arbitrage and round tripping among market dealers.

Likewise, the autonomous foreign exchange market was introduced as a fragment of foreign exchange market in December, 1987. The market rate for foreign exchange was market determined by demand and supply of foreign currency. This enabled the privately obtained foreign exchange to be sold the market, especially by commercial banks. Even so, the market failed to live up to the objectives for setting it up. There were serious infractions in the market thereby leading to sharp depreciation of the exchange rate and the official was equally unrealistic.

In addition, the inter-bank foreign exchange market was introduced in January, 1989. This came up as result of the merger of the official and autonomous market rates. The main thrust for introducing this inter-bank foreign exchange market was because of the failure of foreign exchange market introduced in 1987. In this system, a daily bidding was done, and this enabled the Central Bank of Nigeria to supply the market with available official funds.

Furthermore, the Central Bank of Nigeria in December, 1990 re-introduced the Dutch - Auction system by modifying the inter-bank processes. This was stem to the problem of multiple bidding and foreign exchange hoarding in the system. In this system, the Bureau de Change firms were allowed to participate in the market to enables small users of foreign exchange to have access to the market. The emergence of the Bureau de Change firms widened the scope of legal foreign exchange transactions thereby providing a good competition to the parallel market. The exchange rate continued to depreciate in spite of all measures to stabilize it.

Still, the need to close the gap between the official exchange rate and that of the parallel market rate led to the complete deregulation of the exchange rate system in 1992. In this instance, the main objective was to improve the efficiency of the foreign exchange market. The Central Bank of Nigeria supplied in full the request of the authorized dealers for foreign exchange in order to narrow the parallel market premium. In spite of all measures adopted, the continued to slide due to the need of foreign exchange, therefore leading to the collapse of this system in 1994.

Therefore, the re-introduction of the autonomous foreign exchange market in 1995 was to complement the fixed exchange rate system. Adikibe (2008) stated autonomous foreign exchange market was introduced to counterpart with the fixed exchange rate. The official exchange rate at N21.2960 per dollar was used for public use, including debt service payments and National Priority Projects, while the exchange rate in autonomous foreign exchange market was determined through market forces. The policy also allowed the Central Bank of Nigeria to intervene in the market with a view to stabilizing the rate, while the Bureau de Change were allowed to trade in autonomous fund having granted them concession to buy and sell travelers cheques against their pervious status as authorized buyers only in 1994 (Adikibe, 2008).

However, the fixed exchange rate system complemented by the autonomous foreign exchange market brought untold hardship to the citizens. This was as a result of astronomical rise of inflation rate within that period. Consequently, the monetary authority re-introduced the Dutch auction system of exchange rate management in December, 1995. The introduction was to curtail the adverse effect of the developments in the foreign exchange market, thereby creating a platform for good management of scare foreign exchange resources that were available. This system was discarded in 1999 due to its failure in efficiently allocating the scare foreign exchange, coupled with the rising inflation.

Nevertheless, the abolition of the official exchange rate in 1999 and the need to merge the dual exchange rate led to the re-introduction of inter-bank foreign exchange market in 1999. The main objective was to deepen and broaden the foreign exchange market in order to allow authorized dealers to buy and sell foreign exchange in the market, including the oil companies as well. Nevertheless, cases of round tripping and high demand for foreign exchange marred the system, thereby failing on its set objectives.

Yet, the re-introduction of the Dutch auction system of exchange rate in 2002 was to close the gap between official and parallel exchange rates and, more so to protect the external reserve of the country. Under this arrangement, the exchange rate to extent became stable and the premium between the official and parallel market was drastically narrowed, thereby instilling discipline in the market.

Hence, the success of the Dutch auction system in stabilizing the exchange rate created the need for the Central Bank of Nigeria to further liberalize the market, hence, the introduction of the wholesale Dutch auction system. The main objective of this system was to consolidate on the gains that accrued from the Dutch auction system. These include achieving convergence in exchange rate, reduction in capital flight, market transparency and appreciation of exchange rate. Interesting, the system helped to achieve exchange rate stability over a good period of time. Nevertheless, with the fall in global oil prices and election pressures of 2014, the exchange rate depreciated sharply lead to a wide a gap between the official exchange rate and the parallel market rate. This situation led to the intervention of Central Bank of Nigeria into the market to fix the inter-bank market exchange rate and the suspension of the wholesale Dutch auction system in 2014.

In the words of Mordi (2006), the avalanches of measures clearly reveal the instability of exchange management in Nigeria to address the fundamental objective of price stability and other macroeconomic objectives.

Accordingly, inflation within the period of these exchange rate measures exhibited high volatility. Before 1970, Nigeria experienced a single digit low inflation that was not high enough to cause economic instability. Nevertheless, after the civil war in 1970 and discovery of crude oil, inflation rate in the country rose to double digits. Inflation rate increased from 16% in 1971 to 33.9% in 1975. Within the period of 1980 to 1990 some outstanding incidences of inflation rate were recorded. These are over 30% in 1981; it decreased to 24% in 1983 and later moved up to 41% in 1984. Bawa and Abdullahi (2012) attributed these increases to the import restriction and foreign exchange constraints that led to severe shortages in the supply of goods and services including the devaluation of the naira. During the period of 1990s, inflation showed elements of high volatility. Headline inflation rose rapidly in 1995 to reach an all-time high of 72.8%, though it decelerated gradually to a single digit in 1997 (Gbadebo and Mohammed, 2015). The single digit inflation rate experienced between 1998 and 2001 did not last for long, as the country started facing double digit inflation rate again. According to Gbadebo and Mohammed (2015) inflation rate remained at double digits between 2002 and 2005 as it recorded 12.9%, 14%, 15%, and 17.9% in 2002, 2003, 2004 and 2005 respectively. That, it decelerated dramatically to 8.24% and 5.38% in 2006 and 2007 before rising astronomically to 11.60% and 12.00% in 2008 and 2009 respectively, although fell marginally to 11.8% , 12.3% and 9.6% in 2010, 2013 and 2014 respectively. Consequently, the instability and inability of the exchange rate policy measures failed to dampen inflation volatility in the country.

The seemingly failure of exchange rate channel to achieve price stability might put the country in dire difficulties, by retarding economic growth and expansion. Re-affirming this assertion, Hakeem et al (2015) in their work on “Effects of Inflation Rate on Economic Growth in Nigeria (1986 – 2014)” found that there exist a negative relationship between inflation and economic growth in Nigeria. They advised that concerted effort should be made by policy makers to increase the level of output in Nigeria by improving productivity in order to reduce the prices of goods and services (inflation) so as to boost the growth of the economy.

Nigeria as a country has continued to experience persistent inflation in spite of all measures to control and stabilize it. In Nigeria, one of the main objectives of Central Bank of Nigeria is to maintain price stability in the economy and, this is done by ensuring that rate of inflation is maintained within a certain bound to enable a strong economic activity in all facets of the economy (Emerenini and Eke, 2014). This persistent inflation in Nigeria has led to loss of economic competitiveness.

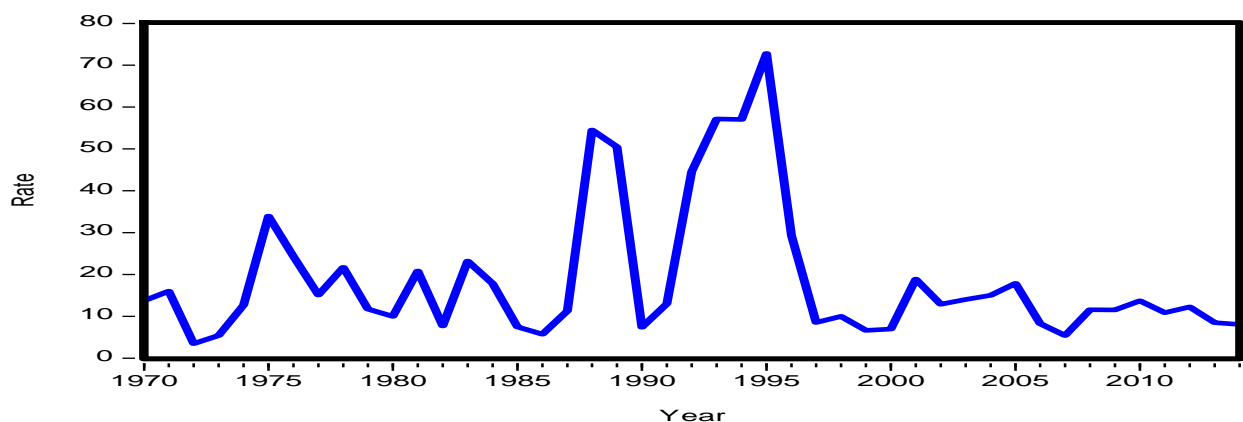


Fig. 1.0 Trend Movement Of Inflation Rate In Nigeria

Source: Author’s computation and Eviews 7.1 Output

The inflation rate movement in Nigeria as shown in Fig. 1.0 has exhibited tremendous up and down movements since 1970. Inflation rate moved from 13.76% in 1970 to 16% in 1971. After 1971 inflation rate dipped to 3.46% and 5.40% in 1972 and 1973 respectively. Nevertheless, there was a sharp increase

in inflation rate to about 33.96% in 1975. Also inflation rate hovered between 7.70% and 24.30% within the period of 1976 and 1982. In addition, inflation rate jumped from 54.51% in 1988 to 72.84% in 1995. There was a serious decrease in inflation rate, from 72.84% in 1995 to 6.62% in 1999. Since year 2000 to 2014 inflation rate has fluctuated between 6.93% and 18.87%.

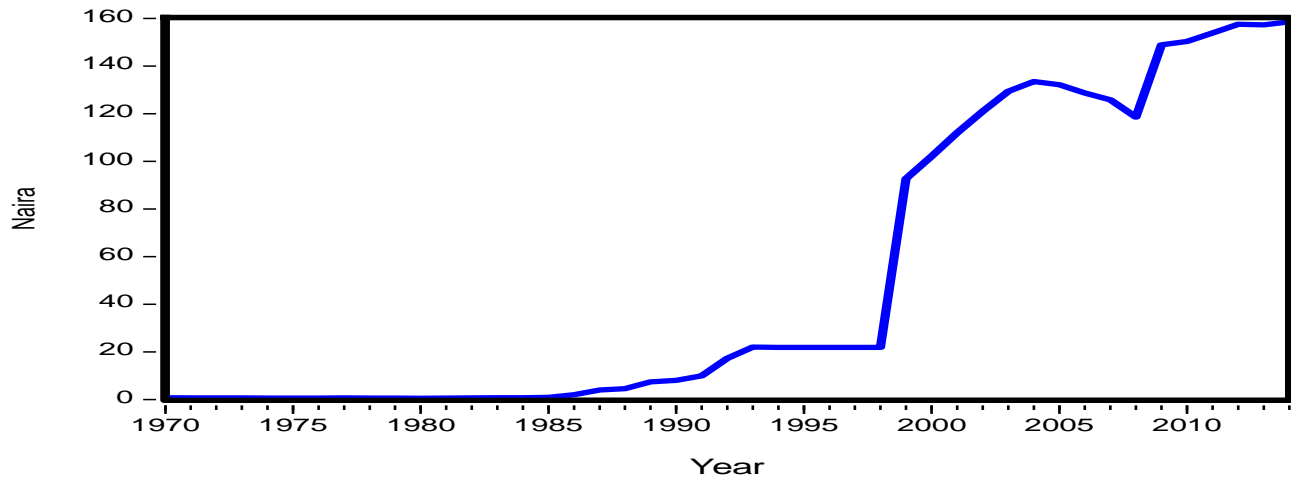


Fig. 1.1 Trend Movement Of Exchange Rate In Nigeria

Source: Author's computation and Eviews 7.1 Output

At any rate, the movement of exchange rate in Nigeria as depicted by the Fig. 1.1 above shows that between 1970 and 1985 exchange rate was fixed and below N1.00. When Nigeria adopted the flexible exchange rate regime in 1986, exchange rate jumped from N 0.89 in 1985 to N2.02 in 1986 about 81.57%. Also, exchange rate moved from N4.02 in 1987 to N17.30 in 1992 which transcends to 145.98%. In addition, between 1994 and 1998 exchange rate remained stable at N21.89. There was an astronomical increase in exchange rate from N21.89 in 1998 to N92.69 in 1999 which is about 144.34%. Similarly, there was another outstanding jump of about 17.61% from year 2001 to 2004. Exchange rate dipped from N132.15 in 2005 to N118.57 in 2008. On the contrary, exchange rate rose consistently from N148.90 in 2009 to N158.55 in 2014.

However, from the above, the naira exchange rate has continued to depreciate against United States of America's dollar since the adoption of Structural Adjustment Programme in 1986. Several exchange rate management policies have been adopted to stabilize the exchange rate movement; this is because the right exchange rate will create that balance in the economy that will encourage production and consumption. Nonetheless, so many challenges have hampered these initiatives. Mordi (2006) stated that several factors have accounted for the instability of naira exchange rate among which are the expansionary fiscal and monetary policies, structural deficiencies in the economy, inadequate funding, as well as the role of authorized dealers and other professional constraints. These challenges to naira instability have caused a lot of problem to the economy. Bakare (2011) stated that, Nigeria continues to be confronted with a number of economic maladies with the exchange rate reforms. Among these problems are low level of savings and investment, high rate of inflation, high level of unemployment and poverty. This situation has caused a lot of concern to the researchers who have described the reform as woes rather than a blessing. Rather than for the economy to adjust into recovery, it continues to deteriorate to the background (Bakare, 2011).

Hence, this study – the effect of exchange rate (pass-through) on inflation in Nigeria will try to unravel the real nature of the relationship existing between exchange rate and inflation in Nigeria in the face of other macroeconomic indicators.

2.0 LITERATURE REVIEW

Several theories have been proposed in economic literatures as the major causes of inflation in both developed and developing countries. Therefore, this research work will be based on some of these theories to enable a complete investigation of the exchange rate effect on inflation in Nigeria. First is the pricing-to-market theory of exchange rate. The pricing-to-market theory is the adjustment of price of the same goods for different markets by the international exporter. Krugman (1986) explained it as the theory of the pricing behavior of markets regarding exchange rate movements. He said this helps foreign firms to maintain their export prices to the different markets as pricing to market. This theory deviates from purchasing power parity, which states that prices of the same goods are equal in different countries if the exchange rate is in common currency. The deviation could be caused by so many factors such as, price discrimination, exchange rate pass-through, temporal shift of profit, market integration, substitution between domestic and foreign variant of the same goods and market structure. Therefore, these factors inhibit complete exchange rate pass-through to importing country's domestic prices. Nigeria is a highly import dependent country. The country imports majority of her consumers' products and raw materials for industries from foreign countries, this puts pressure on the exchange rate and equally affects general price level in the country.

Second is the quantity theory of money. Under this theory, the relationship between national income evaluated at market price and the velocity of money circulation can said to be of equal relationship. The equation shows a positive relationship between price level and money supply, and this can be represented using the quantity equation $MV=PY$.

M is the stock of money in circulation

V is the velocity of circulation

P is the general price level

Y is the total income.

Given an economy based on this theory, there will be a proportionate relationship between the money supply and the price level. This means that an increase in money supply by a certain percentage is expected to increase price level by the same percentage. This ordinarily means that expansion in money supply causes inflation.

In addition, the monetarist theory of inflation states that money supply has a major influence of inflation. This means as money supply increases due to growth in production and employment, this creates an inflationary condition in an economy. The monetarist explaining this phenomenon using the theory of natural rate of unemployment believes that increases in the money supply will exert an increasing impact production and employment in the short run and not in the long run. Therefore, there will be a positive relationship between inflation and money supply. Nevertheless, the natural rate of unemployment conditioned that given resources employment, number of firms and the type of technology in use, the equilibrium output, employment and level of employment are certainly definite. Consequently, an increasing money supply will result in the reduction of natural rate of unemployment and increase in production, in the short run. While, in the long run this will lead to an increasing inflation.

Furthermore, The Keynesian theory of inflation clearly stated in the book, *The General Theory of Employment, Interest and Money* published in 1940. Keynes stated that an aggregate demand using real gross domestic product as proxy is driven by increase in private investment, increase in private consumption and increase in government expenditure when an economy is at its full employment lead to an increase in the general price level. This means an aggregate demand level over and above the full employment of production level will create an inflationary trend.

The Keynesian position is that if people expect any expansion in demand to lead to an increase in output and employment, then it will. This happens because firms will take on more people in anticipation of an increased level of demand for their product.

More so, the structuralism theory of inflation states that the inelasticity in the structures of the economy is the main drive of inflation based on this theory. This is mainly obtainable in the developing countries. This is as result of inelasticity in capital formation, labour force, production level, and agricultural sector,

importation of raw material and consumer products, institutional framework and unemployment structures. Therefore, inflation sets in due to inefficiency in the structures of the economy.

Also, the rational expectation theory of inflation conditions that individuals will form future expectations of inflation based on all available information about the economy policies and current inflation rate, with the outcome that future forecast of inflation will be close to actual inflation rate prevailing in the economy, while, the adaptive expectation theory of inflation states that individuals will form their future expectations of inflation based past inflation rates and economic policies of government for decision making.

At any rate, empirically, in the work of Chuba (2015), he explored to determine the effect of exchange rate changes on consumer prices in Nigeria by the using recursive vector autoregressive model. He used data from first quarter 2000 to fourth quarter 2013. The findings of the study showed that exchange rate fluctuation had a positive and insignificant effect on consumer prices and the increase in consumer prices was mainly due to its own shocks and the increase in money supply in the long run. He believed that stable monetary policy with a low inflationary environment will reduce the pressure of exchange rate changes on consumer prices. Therefore, he recommended that Central Bank of Nigeria should be less concern with the inflation impact of exchange rate shocks and focus fully on other objectives such as growth and export competitiveness in designing exchange rate policy.

Also, Fatai and Akinbobola (2015) in their work investigated the impact of Exchange Rate Pass-through to import prices, Inflation, and monetary policy in Nigeria. Secondary data were used. The data covered the period of 1986-2012. They used annual data on Nominal Effective Exchange Rate Index, Import Prices, Interest Rate , Money Supply and Inflation were sourced from the publication of the Central Bank of Nigeria (CBN) and Oil Price Index were sourced from the World Development Indicators published by the World Bank. The study applied Six-Variable vector autoregressive model to estimate the impulse response function and variance decomposition. In their study, they found out that exchange rate pass-through in Nigeria during the period they reviewed was moderate, significant and persistent in the case of import prices and low and short lived in the case of inflation. In addition, they equally found that exchange rate pass-through was incomplete and has useful implication to policymakers, especially in the design and implementation of exchange rate and monetary policy. Thus, they recommended that policy makers should take into account the incomplete response of import prices when they decide to devalue the currency so as to improve trade balance irrespective of several other factors which might determine the effectiveness of exchange rate policy.

In another study, Ude and Anochie (2014) examined the relationship between exchange rate pass-through, monetary policy and price stability in Nigeria. The study adopted the multi-linear regression model. From their findings, it can be reasonably concluded that general price level is unstable vis a vis nominal exchange rate in Nigeria which inhibits one-to-one exchange rate pass-through. However, the general lesson that emerged from the study was that exchange rate pass-through and implementation capacity are important, especially for determining the effectiveness of exchange rate pass-through on monetary policy and price stability in Nigeria. The study therefore recommended that monetary policy authorities should elect for appropriate exchange rate regime to be able to stabilize exchange rate, domestic import prices and consumer price index. Appreciation of the exchange rate would prove effective in improving Nigeria's external reserve.

More so, Aliyu et al (2013) estimated the exchange rate pass-through to domestic prices in Nigeria using structural vector autoregressive approach. The major finding of the study is that exchange rate pass-through in Nigeria is incomplete and low. Secondly, that the total impact is attained after eight quarters, suggesting that it is quiet slow. The interpreted the low and slow exchange rate pass-through to mean that exporters to Nigeria practice a substantial degree of pricing-to-market strategy. This suggests that instead of allowing the naira price of their products to vary whenever there are changes in the exchange rate, these firms allow their mark-ups to vary as they change their local currency prices in the opposite direction of the change in exchange rate. They argued that this is plausible in Nigeria being a large market for fairly all its imported commodities. Therefore, firms would therefore strive to keep their competitive advantage in the domestic market as exchange rate changes. This explains the low pass-through observed.

One implication of their findings is that the cost of true float may not be as large as it would under complete pass-through, therefore a good potential for de facto float, since only a small fraction of the excessive variations in the exchange rate that such a regime would entail will be passed onto inflation.

In addition, Ogundipe and Egbetokun (2013) investigated the exchange rate pass-through to consumer prices for Nigeria using the vector error correction model approach. The approach was used to address specific features of the Nigeria economy, especially the import dependence nature and the role of foreign exchange inflows in the conduct of monetary policy. The degree of exchange rate pass-through was estimated by means of impulse response function from the vector error correction model. Findings from the study, covering the period 1970 through to 2008, reveals that exchange rate pass-through to consumer prices in Nigeria is substantial. The evident large pass-through found was attributed to the continuous depreciation of the Naira over the whole sample observed. Firms and importers are therefore likely to perceive any increase in costs due to exchange rate depreciation as persisting and therefore, pass on to consumers most of the resultant increases in costs. Further, they argued that reasons for high exchange rate pass-through include the high and persistent inflation during the period under review as well as the high share of imports in the Nigeria consumption basket.

Also, Imimole and Enoma (2011) in their work examined exchange rate depreciation and inflation in Nigeria. Their work covered the period of 1986–2008, using the Autoregressive Distributed Lag Bounds Test cointegration procedure. The results they obtained from the study showed that inflation in Nigeria is highly responsive to exchange rate depreciation, money supply and real gross domestic product. A long run relationship was also found to exist between inflation and exchange rate depreciation, indicating that the model has a self-adjusting mechanism for correcting any deviation of the variables from equilibrium. The implication of this is that additional efforts need to be put in place to increase the volume of export products to make up for the extra demand that may be created by the depreciation. The paper also found that inflation rate in Nigeria has a lagged cumulative effect. They conclude that although exchange rate depreciation may not directly control inflation, it helps to restructure the price mechanism of both import and export, such that Naira depreciation subtly tends to moderate prices in Nigeria, especially imported price inflation. In the same vein they recommended that policy makers should not totally rely on this instrument to control inflation, but should use it to complement other macro-economic policies. More so, policies should be put in place to increase domestic production of export commodities, which are currently short-supplied.

Nevertheless, Loloh (2014) in his work exchange rate pass-through in Ghana explored that the pass-through impact of exchange rate movements on domestic prices between January 1994 and December 2012, using a recursive vector autoregressive model. The model consisted of six variables, which were ordered as: oil prices, output gap, exchange rate, non-food prices, overall consumer prices, and money market interest rates. He found out that the effect of a nominal exchange rate shock on domestic prices was incomplete, broadly modest and decays within 18-24 months, however that such effects were mostly felt within 12 months. More so, that the impact of the exchange rate shock on overall inflation is more benign than for non-food inflation. He also found evidence in support of Taylor's hypothesis that the exchange rate pass-through was positively correlated with the level of inflation.

In their work, Kamel et al (2015) examined the exchange rate pass-through on producer and consumer price indexes in the Algerian economy through an empirical analysis by using the vector autoregressive model upon quarterly data for the 2002-2011. Their findings showed that the consumer price increases in response to an appreciate foreign exchange rates against the Algerian Dinar, while the pass-through of Euro against the Algeria Dinar exchange rate was 'complete' and more increasing in the time horizon compared the pass-through of US dollar and Algeria Dinar exchange rate. In the contrast, the exchange rate pass-through involves a negligible reaction on producer price index. In the second step, of their analysis, the variance decomposition estimate, the magnitude contribution of demand shocks to explain consumer price index and producer price index change ranged from 50% and 17% after thirty quarterly respectively, whereas supply shock (oil price) continued to contribute largely to consumer price index fluctuations (30%) and quite modestly to PPI (5%). They concluded that the fairly modest of pass-through

on producer prices clearly reflect the Dutch Disease effect on Algeria economy and highlighted how the manufacturing sector has been underdeveloped.

In addition, Fetene (2015) investigated the foreign exchange pass-through to domestic prices in Ethiopia for the year 1981 to 2013 using the auto regressive distributed lag (ARDL) cointegration procedure. The result of their study showed that foreign exchanges pass-through to domestic price was not significant. Broad money supply, budget deficit and world commodity price index were the main determinants of domestic consumer price in Ethiopia. Their findings showed that an insignificant exchange rate pass-through provides greater freedom for pursuing an independent monetary policy and facilitates inflation targeting. They concluded that government can devalue Birr as long as it solves the problem of current account deficit but devaluation as policy instrument to stabilize domestic price is not justified based on the result found by this study. However, monetary policy found to be important policy instrument in stabilizing domestic price in Ethiopia.

3.0 METHODOLOGY

The method that was employed to establish the impact of exchange rate (pass-through) on inflation is the ordinary least square method (OLS) (Nwaru, 2002). Therefore, the multiple regression model (Brooks, 2008) were applied to determine the real nature of relationship existing between the variables within period of interest. Nonetheless, before estimating the models, the properties of the variables were substantiated in terms of basic data descriptive, stationarity and long term relationship. The econometric tools that were used for these verifications are the Augmented Dickey-Fuller test for stationarity and Johansen co-integration test for long term relationship given that the variable are integrated of the same order, especially order one I(1). In addition, the direction of causality among these variables was ascertained using the Granger Causality test. The stability of the estimated model was verified using the CUSUM and CUSUMSQ stability tests. This research work- the effect of exchange rate on inflation in Nigeria was investigated using a secondary data. The data used in this study are time series yearly data spanning from 1970 to 2014. These data were sourced from the Statistical Bulletin of the Central Bank of Nigeria (CBN), 2014. These time series data include; Inflation Rate (INF), Exchange Rate (EXC), Money Supply (MOS), Real Gross Domestic Product (RGD) and Import Prices (IMP).

3.1 Model Specification

3.1.1 The Long-Run Model

In order to establish the long-run impact (pass-through) of exchange rate on inflation, the ordinary least square method was applied through a multiple regression model.

Therefore, the functional model for this study is:

$$INF = f(INF-1, EXC, MOS, RGD, IMP) \quad (\text{Model1})$$

Where;

INF = Inflation Rate (%)

INF-1 = Expected Inflation Rate (%)

EXC = Exchange Rate (%)

MOS = Money Supply (%)

RGD = Real Gross Domestic Product (%)

IMP = Import Prices (%)

This can be explicitly written as

$$INF_t = \beta_0 + \beta_1 INF_{t-1} + \beta_2 EXC_t + \beta_3 MOS_t + \beta_4 RGD_t + \beta_5 IMP_t + \mu_t \quad (\text{Model 2})$$

The a priori expectations of these parameters in the long-run model are $\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0, \beta_5 > 0$.

4.0 RESULTS

4.1 Test of Stationarity

The variables were verified for stationarity by subjecting them to a unit root test using Augmented Dickey-Fuller test for stationarity

Table 4.1: Stationarity Test of the Variables

VARIABLES	ADF TEST STAT (AT LEVEL)	AT LEVEL	ADF TEST STAT (1 ST DIFFERENCE)	AT 1 ST	ORDER OF INTEGRATION
				DIFFERENCE	
INF	-3.256282	-2.929734	-----	-----	I(0)
EXC	-5.332071	-2.929734	-----	-----	I(0)
MOS	-3.780365	-2.929734	-----	-----	I(0)
RGD	-6.195363	-2.929734	-----	-----	I(0)
IMP	-7.480335	-2.929734	-----	-----	I(0)

Source: Author's computation and Eviews 7.1 Output

The unit root test in Table 4.1 shows that inflation rate, exchange rate, money supply, real gross domestic product and import prices were found to be stationary at level, therefore integrated of order 0 (I(0)). This because the absolute value of Augmented Dickey-Fuller statistic is greater than the absolute critical value at 5% significance level.

4.2 Cointegration Test

In order to ascertain if there was a long term relationship existing among these variables, a co-integration test was carried out using the Johansen cointegration test.

Table 4.2: Trace test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.534543	100.5552	69.81889	0.0000
At most 1 *	0.505220	67.67159	47.85613	0.0003
At most 2 *	0.360874	37.41498	29.79707	0.0055
At most 3 *	0.206089	18.16588	15.49471	0.0193
At most 4 *	0.174428	8.242166	3.841466	0.0041

Source: Author's computation and Eviews 7.1 Output

Table 4.3: Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.534543	32.88361	33.87687	0.0653
At most 1 *	0.505220	30.25660	27.58434	0.0222
At most 2	0.360874	19.24911	21.13162	0.0899
At most 3	0.206089	9.923711	14.26460	0.2170
At most 4 *	0.174428	8.242166	3.841466	0.0041

Source: Author's computation and Eviews 7.1 Output

The trace test in table 4.2 showed that the hypothesis of no cointegration among the variables can be rejected and at least five cointegrating equations exist. The maximum eigenvalue test in table 4.3, confirmed the presence long run relationship among the variables of interest with at least two cointegrating equations.

4.3 Granger Causality Test

Table 4.4: Granger Causality Test of the Variables

Null Hypothesis:	Obs	F-Statistic	Prob.
EXC does not Granger Cause INF	43	4.40044	0.0191
INF does not Granger Cause EXC		0.57754	0.5661
MOS does not Granger Cause INF	43	0.99341	0.3797
INF does not Granger Cause MOS		1.01171	0.3732
RGD does not Granger Cause INF	43	0.39713	0.6750
INF does not Granger Cause RGD		0.71458	0.4959
IMP does not Granger Cause INF	43	0.42528	0.6567
INF does not Granger Cause IMP		0.65912	0.5231
MOS does not Granger Cause EXC	43	0.86793	0.4280
EXC does not Granger Cause MOS		1.05592	0.3579
RGD does not Granger Cause EXC	43	0.12210	0.8854
EXC does not Granger Cause RGD		0.72564	0.4906
IMP does not Granger Cause EXC	43	0.32360	0.7255
EXC does not Granger Cause IMP		0.91002	0.4111
RGD does not Granger Cause MOS	43	0.04194	0.9590
MOS does not Granger Cause RGD		0.50666	0.6065
IMP does not Granger Cause MOS	43	0.24464	0.7842
MOS does not Granger Cause IMP		0.87470	0.4252
IMP does not Granger Cause RGD	43	0.74039	0.4837
RGD does not Granger Cause IMP		0.29832	0.7438

Source: Author’s computation and Eviews 7.1 Output

The Granger causality analysis presented in Table 4.4 showed that at 5% significance level that most of the variables do not Granger cause each other under pairwise Granger Causality test. It was equally interesting to find that exchange rate did Granger cause inflation in a unidirectional causality form. There was no case of bidirectional causality at 5% significance level.

4.4 Model Estimations

4.4.1 Model 1: Long-Run Model

In estimating the model, the ordinary least method was used to identify the nature of relationship that existed between inflation and other variables using annual data of 1970 to 2014 extracted from the statistical bulletin of Central Bank of Nigeria. The main focus of this estimation is to check if exchange rate has any effect on inflation in Nigeria within the period under consideration. Nevertheless, the impact of other variables on inflation will equally be assessed. Also, in testing the hypothesis, the p-values of the variables will be used by comparing it with the hypothesized significant value of 0.05 for this research study.

Table 4.5: Estimated Long-Run Coefficients

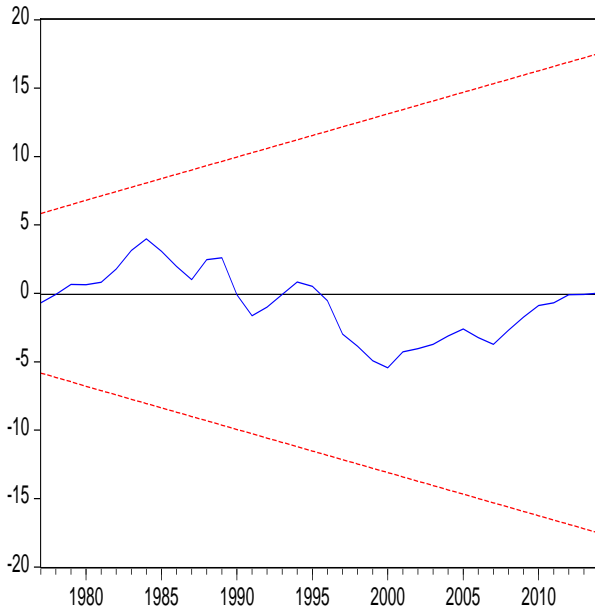
Dependent Variable: INF				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.604198	4.822188	-0.954794	0.3457
INF(-1)	0.584712	0.113942	5.131650	0.0000
EXC	0.042296	0.066305	0.637895	0.0216
MOS	0.418766	0.173719	2.410599	0.0209
RGD	0.008508	0.058630	0.145114	0.8554
IMP	0.103926	0.058717	1.769948	0.0443
R-squared	0.530477	Mean dependent var		18.98364
Adjusted R-squared	0.468697	S.D. dependent var		16.52383
S.E. of regression	12.04430	Akaike info criterion		7.941184
Sum squared resid	5512.479	Schwarz criterion		8.184483
Log likelihood	-168.7061	Hannan-Quinn criter.		8.031411
F-statistic	8.586635	Durbin-Watson stat		1.674021
Prob(F-statistic)	0.000016			

Source: Author's computation and Eviews 7.1 Output

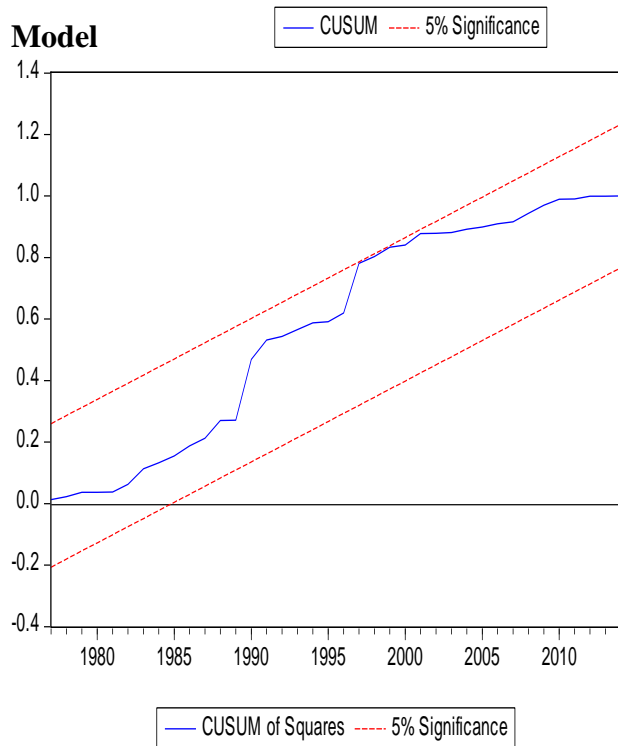
$$INF_t = -4.6042 + 0.5871INF_{t-1} + 0.0423EXC + 0.4188MOS + 0.0085RGD + 0.1039IMP$$

4.5 Test of Stability for the Long-Run Model

Fig. 4.1: Cusum and Cusumsq for the ARDL Long-Run



Model



Source: Author's computation and Eviews 7.1 Output

The CUSUM and CUSUM SQ are used to evaluate the stability of the model when applied on the residuals. It is expected that both CUSUM and CUSUM SQ plots should be within the critical bounds at 5% significant level for the model to be accepted as being stable. From Fig. 4.1, both the CUSUM and

CUSUM SQ plots are within the critical bounds meaning that the model is stable, and therefore it can be used for policy formulation.

4.5 DISCUSSION OF FINDINGS:

(I) Estimated Longrun model:

The impact of exchange rate on inflation was evaluated using the multiple regression method. From the multiple regression model in table 4.5, the coefficient of determination (R^2) of 0.5305 which indicates a 53% of total variation in inflation can be explained by the explanatory variables. The adjusted coefficient of determination (R^2) of 0.4687 or 47%, showed that the explanatory variables were robust in explaining variation in inflation within the period.

The Durbin-Watson statistic (1.6740) of the long-run model is very close to 2 which indicate no presence of autocorrelation in the data. Nonetheless, the F-Statistic has a value of 8.5866 with probability value of 0.0000, which means, it is statistically significant at 5% and the model is a good fit. Therefore, the explanatory variables have a joint significant effect in determining the behavior of inflation in Nigeria within the period of interest.

In terms of the variables, the estimated coefficient (0.5847) of expected inflation showed the right sign and, it is positive and statistically significant. This is in line with the economic theories of adaptive expectation and rational expectation of inflation. This means that past inflation behavior can be used to predict future inflation movements and more so, because citizens are now aware and understand the workings government economic policies it has become easier for them to foretell the inflation performance. This outcome is in line with the work of Imimole and Enoma (2011) regarding the influence of the variable on inflation in Nigeria. This means that a 1% increase in expected inflation will cause inflation to rise by 0.58%.

The estimated coefficient (0.0423) of exchange rate showed that right positive sign and it is statistically significant. Also, the Granger causality test further showed that there is a unilateral relationship between exchange rate and inflation. Exchange rate Granger causes inflation in a unidirectional manner. This result agreed with the works of Fatai and Akinbobola (2015) and Ude and Anochie (2014).

Also, the estimated coefficient (0.0423) of money supply showed the expected sign. The coefficient showed a positive sign and it is statistically significant. The sign agreed with economic theory. Nevertheless, the significant effect of money supply on inflation is in line with the work of Imimole and Enoma (2011). At any rate, a 1% increase in money supply will cause inflation to increase by 0.04%.

In addition, the estimated coefficient (0.0085) of the real gross domestic product is rightly signed. It is positive and but not statistically significant.

Nonetheless, the estimated coefficient (0.1039) of import prices showed the expected positive sign. It is statistically significant at 5% significance level. This means that exchange rate through import prices has an impact on inflation in Nigeria. This is in line with the pricing-to-market theory of exchange rate, that is, an increase in exchange rate does not lead to proportional increase on consumer price especially through import prices. From the coefficient of import price (0.1039), it could be seen that pass through of exchange rate through import prices is less than one (1). This means that as exchange rate depreciates exporters to Nigeria absorb part of the costs in order to retain market share in the country. This means that consumers of imported goods do not feel the full effect of exchange rate depreciation in Nigeria. Nevertheless, this outcome is line with the works of Fatai and Akinbobola (2015) and Ude and Anochie (2014).

(II) Stability of the Model:

The stability of the long-run model was evaluated using the cumulative sum (CUSUM) and cumulative sum of square (CUSUM SQ). The model is highly stable and, can be used for policy making and forecasting purposes as depicted in fig. 4.1

5.0 CONCLUSION AND RECOMMENDATIONS

This study examined the effect of exchange rate on inflation in Nigeria over the period of 1970 – 2014. The method of multiple regression analysis was employed for the estimation of the long-run model. The results from the analysis show that:

- Inflation was responsive to exchange rate.
- The key determinants of inflation were lagged inflation, money supply and import prices.

5.1 Conclusion

One of the functions of Central Bank of Nigeria is to maintain price stability in the country. In this regard, the monetary authority uses exchange rate as a tool for monetary policy transmission to regulate price stability since Nigeria runs an open economy and highly import dependent too. Therefore, the main interest of this study as stated in the statement of problem was to discover why despite several exchange rate policies, the country is still experiencing persistent inflation. Hence, this study has revealed that exchange rate has a direct effect on inflation in Nigeria. This was also confirmed through Granger causality test.

Consequently, this has exposed the reason for several exchange rate policies in the country in order to manage inflation. This implies that government can use exchange rate targeting as means of managing inflation since there is a direct effect of exchange rate on inflation. Accordingly, the Central Bank of Nigeria should develop policies that have direct effect on inflation as policy measures to check inflation movement in the country, especially policies on monetary growth and import management in order to boost local production of goods.

5.2 Recommendations

Following a critical analysis of the effect of exchange rate on inflation within the period under consideration, the subsequent recommendations are made. Firstly, the monetary authority should use exchange rate targeting as a means of controlling inflation since there is a direct effect of exchange rate on inflation in Nigeria, and to support other macroeconomic policies of government.

Secondly, since exchange rate has a significant effect on inflation, the monetary authority cannot devalue the Naira as much as possible to solve any current account deficit and promote export because Nigeria is a highly import dependent country.

Thirdly, policies relating to control of money supply should be effectively exploited in order stabilize consumer price level.

Fourthly, efforts should be made by government to create enabling environment for local industries to thrive in order produce domestically consumer products and raw materials used as inputs by local industries for production instead of relying on imported products and raw materials. More so, export promotion should be pursued and import restrictions management initiated to boost local production.

Finally, monetary authority should monitor the movement of Naira; stern attention should be paid to issues that cause the depreciation of the currency, especially large exchange rate changes.

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