# Exchange Rate Pass-Through, Monetary Policy and Price Stability in Nigeria

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**Abstract:** Government in many developing countries use exchange rate as an instrument for stabilization purposes. This is particularly so for imported commodities and those produced within an economy whose intermediate inputs and raw materials depend heavily on import. This study formulated multi-linear regression models to empirically investigate the impact of exchange rate pass-through on monetary policy and price stability in Nigeria using quarterly data from 1986:1 through 2012:4. Results show that there is complete exchange rate pass-through response with selected monetary policy variables except for interest rate. However, incomplete exchange rate pass-through was found with price stability in Nigeria. It is therefore recommended that there is the need for monetary policy authorities in Nigeria to elect for appropriate exchange rate regime and other monetary policy instruments to be able to stabilize prices with monetary policy variables in Nigeria.

Keywords: Exchange rate, Monetary policy, Price stability, Pass-through, Regime

## 1. Introduction

Economists have traditionally made the simplifying assumption that the prices of tradable goods - once expressed in the same currency – are equalized across countries, that is, that the purchasing power parity condition (PPP) holds [1]. The need for appropriate adjustment mechanism to structural imbalances in many developed countries, especially after the Great Depression of 1929-1933, culminated in extensive researches on exchange rate pass-through (ERPT) with the primary objective of determining a nominal anchor for inflation and inflation expectations. It is widely believed that an understanding of the impact of exchange rate movement on prices would help to gauge the appropriate monetary policy response to currency movements. The increased openness of most developed economies and the incidence of large fluctuations in nominal exchange rates have led to a need for a better understanding of the determinants of the transmission of exchange rate changes into import prices.

In Nigeria, the emphasis on knowing the exchange rate passthrough is underpinned by the fact that the Nigerian economy is external sector driven such that the shocks from global commodity markets have serious implications on the economy. In addition, the need to make the external sector competitive through appropriate exchange rate adjustment has made the study of exchange rate pass-through in Nigeria imperative. Recent developments in the external sector of the Nigerian economy revealed that the naira exchange rate depreciated by 24.0 percent between October 2008 and February 2009 and the pressure is still on as crude oil receipts continue to fluctuate due to both demand and supply factors [2]. The concern therefore is the magnitude and relationship of exchange rate pass-through, monetary policy and price stability in Nigeria.

In 1986, Nigeria adopted a fixed exchange rate regime supported by exchange control regulations that engendered significant distortions in the economy prior to the introduction of structural adjustment programme (SAP). The country depends heavily on imports from various countries as most industries in Nigeria import their raw materials and massive importation of finished goods from foreign countries [3].

Nigeria has undergone tremendous changes especially after the adoption of the Structural Adjustment Programme (SAP), sponsored by the International Monetary Fund (IMF) and the World Bank. The Nigerian currency has depreciated several times and has appreciated on a number of occasions in response to some market fundamentals, so as to attain a realistic exchange rate that would facilitate improved macroeconomic performance and diversify the productive base of the economy. However, the effect of the changes in exchange rate in Nigeria has not produced the desired effects. The economy continued to depend on a single commodity (oil) for greater percentage of its foreign exchange earnings while the output of agriculture which was the mainstay of the economy prior to the discovery of oil, continues to dwindle. Manufacturing sector's output declined for a greater proportion of the period [4].

According to [5] understanding of exchange rate passthrough is of extreme importance for three key reasons: First, the knowledge of the degree and timing of pass-through are essential for the proper assessment of monetary policy transmission on prices as well as for inflation forecasting. Second, the adoption of inflation targeting requires knowledge of the size and speed of exchange rate passthrough into inflations. Finally, the degree of exchange rate pass-through has important implication for "expenditure switching" effects from the exchange rate. In other words, a low degree of exchange rate pass-through would make it possible for trade flows to remain relatively insensitive to changes in exchange rates, though demand might be highly elastic.



Figure 1.1: Exchange rate movement (October 2013 till August 2014)

As depicted by figure 1.1 above, there has been serial depreciation of the Nigerian naira for the period under review, that is, October 2013 through August 2014, though with insignificant fluctuation.

<b>Table 1.1:</b> Exchange rate position (Naira to USD)	te position (Naira to USD)
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Actual	Previous	Highest	Lowest	Dates	Frequency
161.95	162.95	165.65	0.53	1960-2014	Daily

Table 1.1 shows that Nigerian naira has depreciated to the tune of 161.42 (161.95-0.53) since 1960 to August 2014. This has serious implication with Nigerian gross domestic product (GDP), monetary policy and price stability. For instance, between 1971 and 1979, the average growth rate of GDP was 6.3%; this was associated with a negative change in exchange rate (appreciation) of 2.5%. The same scenario was repeated between 2004 and 2007 when an average GDP growth rate of 6.4% was associated with appreciation of exchange rate. In other sub periods, when the exchange rate depreciated, it was associated with a reduced average growth rate of GDP. However, higher growth rate is associated with appreciation in 1971-1979 and 2004-2007 periods while the periods of depreciation of exchange rate are associated with lower growth rates. Following the adoption of SAP and the subsequent improvement in the management of the foreign exchange market, the persistent downward pressure on the domestic currency was stemmed for a while. Some improvements were recorded in the growth of GDP between 1988 and 1990.

However, traditional monetary theory regards excessive money creation as a common source of instability in both the exchange rate and price levels. In the presence of large monetary shocks, price inflation, and exchange rate depreciation should, therefore, be closely linked. Generally, scholars have accepted that, understanding the impact of exchange rate movement on prices is critical from a policy perspective in order to gauge the appropriate monetary policy response to currency movement. Empirical studies [6], [7] have shown that movement in exchange rate and prices is diverse in the short to medium run. An extensive theoretical literature, which has developed over the past three decades, has identified various explanations why exchange rate pass-through (ERPT) to import and consumer prices is incomplete. Empirical analyses have also provided evidence of considerable cross-country differences in the ERPT. A major argument in this respect was suggested by [8], who puts forward the hypothesis that the responsiveness of prices to exchange rate fluctuation depends positively on inflation.

In Nigeria, [7] examined exchange rate pass-through for Nigeria's imports using a Johanson cointegration technique to a sectoral data between 1970 and 2004. The study used the mark-up approach which sets export prices as a mark-up on production costs and finds incomplete pass-through at varying degrees across sectors and concludes that pass-through was much larger in the long-run than in the short-run.

Taking a brief over-view of the studies, the literature has demonstrated the various attempts developed to explain the lack of macroeconomic adjustment from simple to more complex models. One important conclusion obtainable from the review is that virtually all the models have common variables as determinants of either domestic price or import price. Certainly, the market structure and prevailing macroeconomic environment go a long way in determining the suitability of these models to any economy. In general, the literature suggests that pass-through to destination currency prices will be higher in more competitive markets, with more homogeneous products, or where foreign exporters dominate a particular market.

Most of the earlier studies reviewed have focused mainly on the effect of ERPT on prices without considering the tools of monetary policy in Nigeria. This study filled the gap by incorporating monetary policy vis a vis ERPT and price stability in Nigeria. In view of the above discussion, this study addressed the following question: to what extent does exchange rate pass-through impact on monetary policy and price stability in Nigeria? Thus the objective of the study is to investigate the extent of exchange rate pass-through on monetary policy and price stability in Nigeria. Hence, the findings of this study would be relevant to the Central Bank of Nigeria given its task of achieving price stability and stable exchange rate system through appropriate intervention in the market and efficient management of foreign reserves.

In general, three factors may determine the extent of passthrough of exchange rate to domestic prices; the pricing behavior by exporters in the producer countries, the responsiveness of mark-ups to competitive conditions and the existence of distribution costs that may drive a wedge between import and retail prices [9], [10]. For instance, when exchange rate changes, foreign firms can choose to pass exchange rate change fully to their selling prices in export markets (complete pass-through), to bear exchange rate change to keep selling prices unchanged (zero pass-through), or some combination of these (partial pass-through). In reality, exchange rate pass-through is far from complete, [11] argued that "a price response equal to one half the exchange rate change". They discovered that only around 60 percent of exchange rate changes are passed on to import prices in the United States.

The main explanation for incomplete pass-through is that many importing and exporting firms choose to hold their prices constant and simply reduce or increase the mark-up on prices when the exchange rate is changing. [12] justified incomplete pass-through as arising from firms that operate in a market characterized by imperfect competition and adjusts their mark-up (and not only prices) in response to an exchange rate shock. [13] instead emphasized the role of (non-traded) domestic inputs in the chain of distribution of tradable goods. Furthermore, [14] pointed out the measurement problems in CPI, which ignores the quality adjustment of tradable goods to large adjustment in the exchange rate. Another line of reasoning stresses the role that monetary and fiscal authorities play, by partly offsetting the impact of changes in the exchange rate on prices [15].

## 2. Methodology and Data

#### 2.1 Model Specification

This study adopted the multi-linear regression model from [16] for United States, though with few modifications to achieve the study's objective.

However, the choice of the variables was informed by the review of relevant literature. MTP is monetary policy (RR is Nigeria's external reserve, OMO is open market operation (measured by total value of treasury certificates), INR is interest rate), INF is inflation rate, EXCH is exchange rate, DIP is domestic import price, CPI is consumer price index, GDP is gross domestic product, PPI is producer price index, OILP is oil price index.

#### 2.1.1Pre-estimation test: Unit Root Test

The assumption in the equations above is that all the variables exhibit a mean reversing property of stationarity. If the variables are not stationary at level, they shall be differenced by employing Augmented Dickey-Fuller (ADF) test to ensure that the variables attain stationarity. The study shall therefore estimate the following equation:

Where Y is a vector of all the variables and  $\mu t$  is a white noise error term.

#### 2.1.2 Monetary Policy

$$\sum_{i=1}^{n} MTP_{it} = \pi_0 + \pi_I \sum_{j=1}^{n} EXCH_{jt} + \pi_2 \sum_{k=1}^{n} DIP_{kt} + \pi_3 \sum_{g=1}^{n} PPI_{gt} + \pi_3 \sum_{g=1}^{n}$$

$$In\sum_{i=1}^{n} MTP_{it} = \pi_0 + \pi_1 In \sum_{j=1}^{n} EXCH_{jt} + \pi_2 In \sum_{k=1}^{n} DIP_{kt} + \pi_3 In \sum_{g=1}^{n} PPI_{gt} + \pi_4 In \sum_{g=1}^{n} CPI_{zt} + U_{it} \dots (3)$$

where i, j, k, g, z = 1, 2, 3. t is the time variable,  $\pi =$  parametric estimates,  $U_{it} =$  stochastic error term.

#### 2.1.3 Price stability

 $INF_{t} = \alpha_{0} + \alpha_{1}EXCH_{t} + \alpha_{2}DIP_{t} + \alpha_{4}OILP_{t} + \alpha_{5}PPI_{t} + \alpha_{6}GDP_{t} + U_{t} \dots (4)$ 

To obtain the rate of change, equation (4) then becomes:

Where,  $U_t$  = stochastic error term,  $\alpha_i$  = parametric estimates

#### 2.2 Data Source

This study employed time series quarterly data from 1986Q1 to 2012Q4 on the Nigerian economy. Data were obtained from the CBN Statistical Bulletin and Annual Reports 2012.

## 3. Results and Discussion

#### 3.1 Unit Root Test Result

The test was carried out to know whether the mean value and variances of the variables are time invariant, that is, constant over time. The unit root test for stationarity was applied using the Augmented Dickey Fuller (ADF) test.

Table 3.1: Unit root

Integrate	d of ord	er l(1)						
Variables	ADF Stat	Macki non Crit. Valu 1%	5%	10%	Con st ant	Tre nd	La g	No ne
INF	- 6.697 38	3.4733	- 2.88 00	- 2.57 65	Yes	No	2	No
INR	- 7.208 78	- 2.5795	- 1.94 20	- 1.61 68	No	No	2	Yes
LOG_O MO	- 9.141 13	4.0208	- 3.43 99	- 3.14 41	Yes	Yes	2	No
LOG_EX CH	- 6.571 06	4.0193	- 3.43 92	- 3.14 37	Yes	Yes	2	No
LOG_DI P	- 6.516 14	- 4.0245	- 3.44 17	- 3.14 52	Yes	Yes	2	No
LOG_CP I	- 10.01 12	- 4.0224	- 3.44 07	- 3.14 46	Yes	Yes	2	No
LOG_G DP	- 9.292 65	- 4.0179	- 3.43 85	- 3.14 33	Yes	Yes	2	No
LOG_PP I	- 8.000 69	- 2.5795	- 1.94 20	- 1.61 68	No	No	2	Yes
LOG_OI LP	- 6.324 69	2.5828	- 1.94 26	- 1.61 71	No	No	2	Yes
LOG_RR	- 8.129 74	4.0179	- 3.43 85	- 3.14 33	Yes	Yes	2	No

From table 3.1, it is observed that all the variables are stationary after taking their first difference. From the Augmented Dickey Fuller (ADF) test results, intercept is not included in interest rate, producer price index and oil price index because their line graphs started from origin. However, intercepts of inflation rate, open market operation, exchange rate and domestic price index are statistically insignificant

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while intercepts of consumer price index (CPI), gross domestic product and external reserve are statistically significant at lag 1 while all the variables except CPI are statistically insignificant at lag 2. price index. This finding is in tandem with the finding by [15].

From figure 3.2 below, it is observed that the variables drift together in the long-run toward one-to-one exchange rate pass-through with open market operation as the base variable.

Table 3.2: Exchange rate Pass-through with external reserve

Variable	Coefficient	Std. Error	t-Statistic	Prob.
С	0.830919	0.388336	2.139690	0.0340
LOG_EXCH	0.960208	0.021566	44.52396	0.0000
LOG_DIP	0.766793	0.059912	12.79870	0.0000
LOG_CPI	0.376813	0.098688	3.818219	0.0002

From table 3.2, the study found that there is a complete exchange rate pass-through to external reserve since there is approximately one-to-one response from nominal exchange rate to external reserve. This implies that exchange rate has a significant effect on external reserve in Nigeria after controlling for domestic import prices and consumer price index. This contradicts the findings by [11].



Figure 3.1: Scatter Plot of exchange rate with external reserve

From the graph above (that is, figure 3.1), domestic import price drift farther apart while exchange rate drifts towards converging with consumer price index toward effective exchange rate pass-through on external reserve (the base variable)

 Table 3.3: Exchange rate Pass-through with open market

operation							
Variable	Coefficient	Std. Error	t-Statistic	Prob.			
С	17.05323	2.189088	7.790107	0.0000			
LOG_EXCH	0.955206	0.053519	17.84782	0.0000			
LOG_OILP	0.209974	0.113069	1.857042	0.0660			
LOG_PPI	-1.827458	0.516643	-3.537178	0.0006			

From table 3.3, the study found complete exchange rate passthrough to open market operation since there is also approximately one-to-one response from nominal exchange rate to open market operation. This implies that exchange rate has a significant effect on open market operation in Nigeria after controlling for oil price index and producer



Figure 3.2: Scatter Plot of exchange rate with Open Market Operation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
С	4.648254	0.019647	236.5829	0.0000
LOG_EXCH	0.016165	0.001091	14.81519	0.0000
LOG_CPI	0.066123	0.004993	13.24314	0.0000
LOG_DIP	-0.029157	0.003031	-9.618972	0.0000

From table 3.4, the study found incomplete exchange rate pass-through to interest rate since there is approximately one-to-zero response from nominal exchange rate interest rate in Nigeria after controlling for domestic import prices and consumer price index. This finding supports the findings by [11].



Figure 3.3: Scatter Plot of exchange rate with Interest Rate

From figure 3.3 above, the study observes that the variables initially drift apart from each other but consumer price index and exchange rate tend to converge later. Thereafter, they drift apart, this time with high degree of stability and predictability, diverging from interest rate (base variable).

Table 3.5: Exchange rate Pass-through with Price stability

Variable	Coefficient	Std. Error	t-Statistic	Prob.
С	6.004785	88.55728	0.067807	0.9461
LOG_EXCH	0.155921	5.239403	0.029759	0.9763
LOG_DIP	1.789582	6.262668	0.285754	0.7756
LOG_OILP	-17.01026	6.597188	-2.578411	0.0113
LOG_PPI	-59.19497	27.95182	-2.117750	0.0366
LOG_GDP	2.680021	4.928373	0.543794	0.5877

From table 3.5, the study found incomplete exchange rate pass-through to domestic general prices since there is approximately one-to-zero response from nominal exchange rate interest rate in Nigeria after controlling for domestic import prices and consumer price index. This finding supports the findings by [7], [12].

# 4. Conclusion

The failure of any monetary policy to fulfill the objectives for which it was established is often the precondition that calls for questioning of the efficacy of the monetary policy. In order for people to feel at any particular moment in time the need to change its monetary policy, it is necessary that new ideas and needs have emerged in which the former policy/policies is/are no longer adequate. Such new ideas and needs can be internally induced, arising from within the monetary policy authorities themselves or they can be induced by external forces including economic, political, cultural factors from within the larger society.

The study examined the relationship between exchange rate pass-through, monetary policy and price stability in Nigeria. From our 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 passthrough. However, the general lesson that emerges from this study is 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 recommends 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.

# 5. Future Scope

This study is by no means an exhaustive treatment of exchange rate pass-through, monetary policy, and price stability in Nigeria, but it will serve as a prelude for promoting further taught of the topic. Further studies could as well attempt higher data frequency with more robust models.

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