

ATM Acquisition, Floating of the Naira, and Prices of Imported Commodities in Nigeria

Kazeem Adewale ADEOYE¹

Olalekan OBADEMI²

^{1,2}University Of Lagos Business School

Corresponding Email: kadeoye001@gmail.com

ABSTRACT

This study examined the floating exchange rate system in Nigeria and its impact on the prices of Automated Teller Machines (ATMs). The study covered an 18-month period spanning January 2023 to June 2024, encompassing the first year of the floating policy and six months under the preceding fixed exchange rate system. Secondary data on official exchange rates were sourced from the Central Bank of Nigeria (CBN) statistical reports, while parallel market rates were collated from reliable sources. Primary data were obtained through a structured questionnaire administered to employees of Deposit Money Banks (DMBs) in Nigeria. Pearson correlation analysis was employed to establish the relationship between official and parallel market rates, while Ordinary Least Square (OLS) regression was adopted to model average ATM prices as a function of average official exchange rates. Findings revealed a very strong positive relationship between official and black-market rates. The regression model indicated a partial, above 50% exchange rate pass-through (ERPT) effect on average ATM prices. Descriptive analysis of survey responses further indicated that DMB employees perceived the floating policy as having a significant negative impact on ATM acquisition due to elevated prices. It is recommended that the monetary authorities intervene to curtail foreign exchange volatility, and that businesses with imported technology develop pricing strategies that account for price elasticity in response to exchange rate fluctuations.

Keywords: *ATM Acquisition, Exchange Rate Pass-Through, Floating Exchange Rate, Imported Commodities, Deposit Money Banks.*

1. INTRODUCTION

Foreign exchange (FX) rates are pivotal indicators in international business relations, reflecting a country's economic viability and stability (Uford, 2017). Countries regulate FX rates through fixed or floating exchange rate systems, particularly in import-dependent economies such as Nigeria, where exchange rates directly influence the prices of imported goods and consumer purchasing decisions (Oyadeyi et al., 2024).

As a developing nation heavily reliant on imported commodities, including information technology infrastructure, Nigeria's business performance is substantially affected by FX fluctuations (Akpan & Uford, 2024). In June 2023, following the inauguration of President Bola Ahmed Tinubu, the Central Bank of Nigeria (CBN) transitioned from a fixed exchange rate system to a floating exchange rate system, permitting market forces of supply and demand to determine the naira's value. This policy shift produced notable socio-economic effects, particularly on the prices of imported goods, consumer purchasing power, and organisational performance.

This study investigates the impact of the floating naira policy on the prices of imported goods, with specific focus on the acquisition of Automated Teller Machines (ATMs) by Deposit Money Banks (DMBs) in Nigeria. The study spans the period June 2023 to May

2024.

Objectives Of the Study

The aim of the study is to investigate the floating of the naira and the prices of imported commodities in Nigeria between June 2023 and May 2024, using ATM acquisition by DMBs as a case study. The specific objectives are to:

- i. investigate the relationship between official and parallel foreign exchange rates in Nigeria.
- ii. examine the trends in exchange rates and the arbitrage arising from the floating policy.
- iii. measure the effect of exchange rates on the price of imported ATMs; and
- iv. assess the impact of the floating exchange rate policy on ATM acquisition by DMBs in Nigeria.

Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H₀₁: There is no significant relationship between official exchange rates and black-market rates.

H₀₂: There is no significant relationship between exchange rates and the price of ATMs.

H₀₃: There is no significant impact of the floating exchange rate policy on ATM prices in Nigeria.

2. LITERATURE REVIEW

Change in Government and Economic Reforms

Political transitions significantly reshape the macro-economic environment of any nation. On May 29, 2023, Nigeria inaugurated President Bola Ahmed Tinubu, who subsequently implemented two critical economic reforms: the removal of the petroleum motor spirit (PMS) subsidy in May 2023, and the unification of foreign exchange markets in June 2023 (Edun, 2024). The exchange rate unification policy was implemented through the CBN by transitioning from a fixed to a floating exchange rate system. In contemporary global economy, there is advocacy for self-reliance and dependency on local raw material for refining of finished products and hence the focus on innovations with comparative advantage by every nation for services guarantee and efficiency (Charles & Uford, 2023). However, this may lead to the introduction of new products or techniques or of a new quality that consumers are not yet familiar with (Umoh, 2024). The floating policy aimed to eliminate multiple foreign exchange windows, consolidating them into a single willing buyer willing seller model and reducing exchange rate arbitrage (Cardoso, 2024). Furthermore, SWOT Analysis is a strategic planning tool used to identify and analyze the internal and external factors that can impact a startup's success (Edet et al., 2024).

Theoretical Framework

Exchange Rate Pass-Through (ERPT) Theory

Exchange rate pass-through (ERPT) refers to the degree to which changes in exchange rates are transmitted into the domestic prices of imported goods (Jakpa et al., 2024). In a floating exchange rate system, currency depreciation typically leads to higher prices for imported commodities as importers adjust to elevated local currency costs (Goldberg & Knetter, 1997). Mathematically, ERPT is expressed as:

$$\text{ERPT (\%)} = (\Delta Y / \Delta X) \times (X_0 / Y_0)$$

Where X_0 is the initial exchange rate, ΔX is the change in exchange rate, Y_0 is the initial price, and ΔY is the change in price.

Law of One Price (LOP)

The Law of One Price (LOP) posits that in an efficient market, identical goods must have a single price when expressed in the same currency, assuming no transportation costs or differential taxes. Expressed as $P_d = E_t \times P_f$, where P_d is the domestic price, E_t is the nominal exchange rate, and P_f is the foreign price, LOP underscores how exchange rate movements influence import pricing (Isard, 1977; Jakpa, 2024). In the Nigerian context, this theory helps explain price disparities arising from exchange rate changes and their eventual adjustments over time.

Purchasing Power Parity (PPP) Theory

The Purchasing Power Parity (PPP) theory suggests that exchange rates should, in the long run, adjust to equalise the prices of identical goods across countries. In the short term, however, deviations from PPP are common due to transport costs, tariffs, and market segmentation (Rogoff, 1996). PPP provides a useful framework for understanding the long-term behaviour of exchange rates and their impact on import prices.

Literature Review

Empirical literature on exchange rate pass-through (ERPT) provides substantial evidence that the transmission of exchange rate fluctuations to import prices is heterogeneous, incomplete, and highly context-dependent, particularly across developed and developing economies. In a cross-country study, Francesco Caselli and Agnès Roitman (2019) examined ERPT into import and consumer prices across a broad population of advanced and emerging economies using a large panel dataset comprising over 100 countries. The study employed panel regression techniques with macroeconomic indicators such as inflation, exchange rate volatility, and monetary policy credibility. The effective sample size included annual observations spanning multiple decades. The authors found that ERPT into import prices is generally incomplete but significantly higher in economies characterised by high inflation and weak monetary policy credibility. Therefore, Entrepreneurship is believed to be the corner stone for poverty alleviation and key factor to national development. One of its outstanding significances in nation building is its role in shaping the landscape of a country's economy and creating social change through innovations. (Umoh, 2021). However, despite the robustness of the statistical approach, the study is limited by its macro-level aggregation and lack of sector-specific analysis, particularly in infrastructure-intensive sectors such as financial technology and ATM systems.

Similarly, Jongrim Ha et al. (2020) conducted a global empirical analysis using a large dataset covering both developed and developing economies. The study population consisted of countries with available trade and price data, with a sample comprising disaggregated commodity-level observations. Using econometric decomposition techniques and regression-based pass-through estimation models, the authors found that ERPT is higher for non-durable goods than durable goods in developed economies due to differences in price flexibility and market structures. However, the study acknowledges that such distinctions may be less applicable in developing economies where structural rigidities and high import dependence persist. A key limitation of the study is its limited coverage of Sub-Saharan African economies and the exclusion of institutional variables such as foreign exchange restrictions and regulatory constraints, which are critical in contexts like Nigeria.

In another influential study, Mai Chi Dao, Davide Furceri, and Prakash Loungani (2021) analysed the inflationary effects of exchange rate movements across a population of advanced and emerging economies using a panel structural model. The dataset comprised country-level macroeconomic indicators over several years, with a large sample size sufficient for robust panel estimation. The study employed structural econometric modelling

techniques to isolate the effects of exchange rate shocks on inflation. Findings indicate that exchange rate depreciation significantly increases import prices and domestic inflation, with stronger pass-through effects observed in emerging markets due to higher import dependence and weaker policy anchors. However, the study is largely macroeconomic in orientation and does not provide sector-specific insights relevant to infrastructure-dependent industries such as ATM systems. Economists are vastly divided on the desirability and impacts of fiscal deficit on the economy (Ekpo et al., 2024).

Further extending the literature, Raphael Auer, Andrei Levchenko, and Philip Sauré (2022) utilised micro-level price data within a global value chain framework to investigate ERPT dynamics. The study population consisted of firms and industries across multiple countries integrated into global supply chains, with a large dataset of price observations. Using econometric modelling techniques, including regression analysis and value chain decomposition, the authors found that global value chain integration reduces ERPT in developed economies. However, in developing economies with limited diversification, pass-through effects remain relatively strong. Despite its methodological sophistication, the study does not provide Africa-specific evidence, particularly for economies with structural foreign exchange constraints such as Nigeria.

Empirical evidence from African economies further supports the significance of ERPT. Zelealem Yiheyis and Stephen Musau (2021) examined the relationship between exchange rate movements and inflation in Kenya. The study population consisted of Kenyan macroeconomic time-series data, with quarterly observations forming the sample. Using a vector autoregression (VAR) model as the primary statistical tool, the study found that a 1% depreciation of the Kenyan shilling leads to approximately a 0.4% increase in consumer prices, indicating a moderate but statistically significant pass-through effect. However, the study is limited by its aggregate focus and does not disaggregate the impact across sectors, particularly infrastructure-related imports.

Similarly, Samuel Muhwezi and Dmitry Nkusu (2023) investigated exchange rate shocks in Uganda using a structural vector autoregression (SVAR) model. The study utilised national macroeconomic time-series data as its population, with a sample covering multiple years of quarterly observations. The findings reveal that a 1% depreciation of the Ugandan currency increases consumer prices by approximately 0.35%, confirming partial but economically significant ERPT. However, like other macro-level studies, the research does not consider firm-level or sector-specific price dynamics, limiting its applicability to ATM infrastructure analysis.

More sector-specific insights are provided by Nkunde Mwase and Yin Yang (2022), who examined ERPT in Tanzania using a sectoral panel dataset. The study population comprised different sectors of the Tanzanian economy, with a sample of sector-level price data across time. Using panel regression analysis, the authors found significant sectoral heterogeneity in pass-through rates, with durable goods exhibiting higher pass-through (approximately 0.45) compared to non-durable goods (approximately 0.25). This finding is particularly relevant for ATM infrastructure, which falls under capital-intensive durable imports. Therefore, it is critical to invest in human capital through training and education, given that agricultural technology is rapidly evolving (Utuk et al., 2024). However, the study does not incorporate institutional variables such as foreign exchange controls and regulatory policies.

More recently, JaeBin Ahn, Mitali Das, and Papa N'Diaye (2023) employed a hybrid firm-level and macro-panel dataset to analyse ERPT under inflationary shocks. The study

population included firms across multiple economies, with a large sample size combining firm-level pricing data and macroeconomic indicators. Using advanced econometric techniques, including panel regression and structural modelling, the authors found that ERPT intensifies during periods of macroeconomic instability, particularly in emerging markets where cost pressures and weak price rigidity prevail. Nonetheless, the study does not explicitly examine infrastructure-intensive sectors such as ATM systems. However, the constant rise in the cost of imports in such a troubled economy like Nigeria's requires the need for the nation to look inward by prioritising indigenous products in her multi-sectorial developmental drive (Umoh et al., 2024).

Taken together, these empirical studies provide strong evidence that ERPT is a critical transmission mechanism through which exchange rate volatility affects import prices, particularly in developing economies characterised by high import dependence and weak monetary policy frameworks. However, a consistent gap in literature is the limited application of ERPT analysis to sector-specific contexts, especially infrastructure-intensive industries such as ATM and digital banking systems. Additionally, there is limited empirical focus on Nigeria, where foreign exchange constraints and regulatory dynamics significantly shape cost structures. This gap underscores the need for sector-specific empirical investigation into how exchange rate volatility influences the economic viability and sustainability of ATM enterprises, thereby justifying the relevance of the present study.

3. METHODOLOGY

The study employed a quantitative research design utilising both primary and secondary data. Secondary data comprised monthly foreign exchange rate series for Nigeria covering 18 months from January 2023 to June 2024, sourced from the CBN database for official rates and credible online publications for parallel market rates. Primary data were collected through a structured questionnaire administered to staff of Deposit Money Banks (DMBs) in Nigeria. Of the 35 DMBs classified by the CBN comprising 26 commercial banks, 6 merchant banks, and 3 non-interest banks the six merchant banks were excluded owing to their non-retail orientation and limited ATM deployment. The target population thus comprised 29 banks.

A purposive sampling technique was adopted, with respondents drawn from Procurement, E-Business, and Information Technology departments. The questionnaire was distributed electronically via Google Forms and WhatsApp, supplemented by snowball referrals over a two-week period. A total of 53 responses were received, of which 51 were valid after data cleaning. The instrument comprised 14 items structured into seven sections, with 12 closed-ended and 2 open-ended questions.

Data analysis was conducted using SPSS and Microsoft Excel. Pearson correlation analysis was employed to determine the strength and direction of relationships between exchange rates and ATM prices. Ordinary Least Squares (OLS) regression was used to estimate the effect of official exchange rates on average ATM prices. A backward elimination procedure was applied to exclude insignificant predictors. ERPT was derived from the regression coefficient and expressed as the percentage change in domestic prices resulting from a unit change in exchange rates. All hypotheses were tested at the 5% significance level.

Results

Descriptive Statistics of Exchange Rates

Table 1 presents the descriptive statistics of official and parallel market exchange rates between January 2023 and June 2024. The mean official monthly average rate over the 18-

month period was N906.96/\$, while the mean parallel market rate was N1,081.39/\$. The overall market average clustered around N994.17/\$. The official rates followed a positively skewed distribution (mean > median: N906.96 > N792.00), while the parallel market rates approximated a normal distribution (mean ≈ median: N1,081.39 ≈ N1,080.00). The minimum and maximum official rates recorded were N455/\$ and N1,506/\$ respectively, while the parallel market ranged from N635/\$ to N1,595/\$. The arbitrage between both rates had a maximum of N365/\$ and a minimum of -N7/\$.

Table 1: Foreign Exchange Rates Statistics (January 2023 – June 2024)

Statistic	Official Rate (N/\$)	Parallel Rate (N/\$)	Market Average (N/\$)	Arbitrage (N/\$)
Mean	906.96	1,081.39	994.17	174.43
Median	792.00	1,080.00	-	-
Minimum	455.00	635.00	-	-7.00
Maximum	1,506.00	1,595.00	-	365.00

Following the floating policy in June 2023, both exchange rates rose sharply and consistently. The official rate, which averaged N465/\$ prior to the policy, escalated to an average of N907/\$ by December 2023, a 99.3% increase. The parallel market rate rose from N763/\$ in May 2023 to N1,215/\$ in December 2023, representing a 59.2% increase. Both rates attained their respective peaks in February 2024 (N1,506/\$ official and N1,595/\$ parallel). Notably, in April 2024, the official rate briefly exceeded the parallel rate by N7/\$, marking an unprecedented development in Nigeria's foreign exchange history. The arbitrage, which stood at approximately N1/\$ at the inception of the floating policy, had risen to N308/\$ within six months.

Correlational Analysis

Table 2 presents the Pearson correlation coefficients among Average ATM Price, CBN Official Rates, and Black-Market Rates over the 18-month study period.

Table 2: Pearson Correlation Matrix (N = 18 Months)

Variable	Average ATM Price (N)	CBN Official Rates	Black-Market Rates
Average ATM Price (N)	1.000	.902**	.943**
CBN Official Rates	.902**	1.000	.854**
Black-Market Rates	.943**	.854**	1.000

**** Correlation is significant at the 0.01 level (2-tailed).**

The results indicate a very strong positive correlation between Average ATM Price and CBN Official Rates ($r = .902, p < .001$), and an even stronger correlation between Average ATM Price and Black-Market Rates ($r = .943, p < .001$). Additionally, a strong positive correlation was observed between CBN Official Rates and Black-Market Rates ($r = .854, p < .001$). These findings confirm that H_{01} is rejected, indicating a significant positive relationship between official and parallel market exchange rates.

Similarly, H_{02} is rejected, as exchange rates significantly relate to ATM prices.

Regression Analysis

Table 3 presents descriptive statistics and Table 6 the model summary for the regression analysis based on 14 months of data (May 2023 to June 2024).

Table 3: Descriptive Statistics (N = 14)

Variable	Mean	Std. Deviation
Average ATM Price (N)	11,631,700.93	4,092,502.86
Average Official Exchange Rate (N/\$)	1,034.71	351.32

Table 4: Model Summary

Model	R	R ²	Adjusted R ²	Std. Error
1	.933	.870	.860	1,532,951.79

Table 5: Regression Coefficients

Variable	B	Std. Error	Beta (β)	t	Sig.
(Constant)	385,822.86	1,317,537.70	-	0.293	.775
Avg. Official Rates	10,868.58	1,210.21	.933	8.981	.000

The regression model explains 87% of the variance in average ATM prices ($R^2 = .870$, Adjusted $R^2 = .860$), and the model is statistically significant ($F = 80.654, p < .001$). The constant ($\beta_0 = 385,822.86$) is not statistically significant ($p = .775$), while the coefficient for average official exchange rates ($\beta_1 = 10,868.58$) is highly significant ($p < .001$), indicating that for each unit increase in the official exchange rate, the average ATM price increases by approximately N10,868.58. The parallel market rate was auto-excluded by the backward elimination procedure as an insignificant predictor. The regression model is thus expressed as:

$$\text{Average ATM Price (N)} = 385,822.86 + 10,868.58(\text{CBN Rate}) + \varepsilon$$

Exchange Rate Pass-Through (ERPT) Estimation

Using the ERPT formula;

$ERPT (\%) = (\Delta Y / \Delta X) \times (X_0 / Y_0)$ with May 2023 as the base period ($X_0 = N465/\$$; $Y_0 = N6,677,750$) and June 2024 as the end period ($X_1 = N1,482/\$$; $Y_1 = N14,835,000$), the computed ERPT is approximately 56%. This indicates that approximately 56% of the exchange rate change was transmitted into ATM prices over the study period, confirming a significant but partial pass-through effect.

H_{03} is therefore rejected; the floating exchange rate policy had a significant impact on ATM

prices in Nigeria.

Perceptions of Deposit Money Banks' Employees

Survey data from 51 valid respondents revealed that the majority (66.7%) had high or very high awareness of the floating exchange rate policy. Over three-quarters (84.3%) agreed or strongly agreed that the policy negatively impacted purchasing power and procurement budgets. A majority (76.5%) believed the policy directly affected ATM prices, while 58.8% agreed it influenced ATM acquisition decisions. Only 4% disagreed that the cost of ATM services was affected by the exchange rate. These findings corroborate the quantitative evidence, confirming widespread perception of the policy's adverse impact on ATM acquisition among DMB employees.

4. DISCUSSION

The study's findings are consistent with established exchange rate pass-through literature. The strong positive correlation ($r = .902$ to $.943$) between exchange rates and ATM prices aligns with the theoretical predictions of ERPT, the Law of One Price, and PPP theory. The observed 56% ERPT is consistent with findings by Campa and Goldberg (2005), who reported approximately 60% pass-through in developed economies, and with Adeniyi et al. (2012), who noted higher rates in developing nations. The convergence of official and parallel market rates immediately after the floating policy reducing arbitrage from an average of 60% to less than 1% within the first year validates the CBN's unification objective. However, the subsequent divergence of both rates and the escalation of ATM prices demonstrate the socio-economic costs of exchange rate liberalisation in import-dependent economies.

The perceptions of DMB employees further reinforce the quantitative findings. The high awareness of the policy and the broad consensus on its adverse effects on ATM procurement reflect the real operational challenges faced by financial institutions in managing imported technology under a volatile exchange rate environment. These findings are particularly significant given that ATMs remain critical infrastructure for financial inclusion in Nigeria.

5. CONCLUDING REMARKS

Conclusion

The study concludes that the transition from a fixed to a floating exchange rate system in Nigeria produced a significant and sustained increase in ATM prices, with an exchange rate pass-through effect of approximately 56% within one year of the policy. A very strong positive correlation exists between official exchange rates, parallel market rates, and ATM prices. While the unification policy achieved its primary objective of reducing arbitrage, the associated price escalation has had significant adverse implications for ATM acquisition by DMBs. The findings underscore the broader impact of exchange rate volatility on imported technology goods in developing economies.

Recommendations

Based on the findings, the following recommendations are proposed:

- I. The monetary authorities should implement targeted foreign exchange interventions to reduce volatility and mitigate the pass-through effects on prices of imported goods and critical technology infrastructure.
- II. Deposit Money Banks and other institutions that import technology products should develop dynamic pricing strategies and procurement frameworks that account for exchange rate elasticity, enabling more resilient and informed acquisition decisions.

- III. Further research is recommended on the relationship between ERPT and price elasticity of demand for ATMs and other imported technology products in Nigeria, to better inform monetary and fiscal policy design.

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