

An Asymmetrical Approach to Exchange Rates, Inflation Uncertainty, and Savings in Nigeria

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Abstract

This study uses the Nonlinear Autoregressive Distributed Lag (NARDL) model to examine the asymmetric effects of inflation uncertainty and exchange rate volatility on savings behaviour in Nigeria. The findings show that savings are adversely affected by positive cumulative changes in inflation uncertainty, as measured by the GARCH-based conditional variance of inflation. Households are forced to devote more resources to immediate spending due to rising inflation uncertainty, especially during periods of food scarcity and insecurity. However, because families continue to have doubts about long-term economic stability, a decrease in inflation concerns does not immediately lead to increased savings. Additionally, because consumers anticipate further currency depreciation, past currency depreciation has a long-lasting, detrimental impact on savings. These results provide insights into the intricate relationships among exchange rate volatility, inflation uncertainty, and savings behaviour in Nigeria when examined within the frameworks of Precautionary Savings Theory, the Life Cycle Hypothesis, and the Permanent Income Hypothesis.

Keywords: Nonlinear Autoregressive Distributed Lag (NARDL), Exchange Rate, Savings, Generalized Autoregressive Conditional Heteroskedasticity (GARCH)

Introduction

Nigeria has experienced a complicated economic climate in recent decades, characterized by frequent fluctuations in exchange rates and escalating inflation. These elements have a big impact on how households and companies handle their finances, especially when it comes to saving and investing. Due to its substantial reliance on oil exports, Nigeria's economy is susceptible to changes in the price of oil globally, which have an immediate impact on its foreign exchange reserves and the value of the Naira. According to Jakaiye (2001) and Adewuyi & Akpokodje (2013), this reliance on oil income creates cycles of currency volatility that affect domestic price levels and financial planning in several sectors. As a result, people and companies must navigate a difficult climate where the true worth of savings and their purchasing power are constantly changing due to macroeconomic forces that are mostly beyond of their control.

The Nigerian government, especially the Central Bank of Nigeria (CBN), has implemented a number of policy steps to stabilize the economy and control inflation. To control inflation and preserve a stable currency, the CBN has used monetary measures like interest rate changes and direct foreign exchange market interventions. Current attempts to lessen the negative effects of macroeconomic volatility on daily economic decisions are demonstrated by recent policy changes, such as modifications to fuel subsidies and currency reforms (Barro, 1995; Odusola & Akinlo, 2001). Sustained stability is nevertheless difficult despite these measures, with inflation and volatile currency rates creating constant uncertainty. In reaction to projected or real declines in purchasing power, this environment forces people and companies to modify their investment and saving practices. According to research, households frequently raise their precautionary savings during periods of high inflation, whereas corporations may decrease their savings due to squeezed profit margins (Alagidede & Ibrahim, 2017; Schito et al., 2023). These reactions highlight the necessity to investigate the complex interaction between these economic issues and Nigerian savings behavior.

This study aims to answer a number of important questions: How do fluctuations in inflation and exchange rates impact Nigerian households' and businesses' saving habits? Do the size of currency or price changes have a substantial impact on the intensity of these effects? What legislative measures could lessen any adverse consequences? By providing answers to these queries, this study advances a sophisticated comprehension of the factors influencing savings behavior in Nigeria and provides empirical data that may guide the creation of more sensible policies.

According to Aizenman and Lee (2007), stable savings rates are crucial for Nigeria's long-term economic growth because they offer a basis for investment, lessen dependency on foreign funding, and foster financial security inside the domestic economy. Given Nigeria's history of economic oscillations and external shocks, the interaction of exchange rate volatility, inflation, and savings behavior poses a serious economic dilemma. Increased uncertainty about future savings and price stability results from unpredictable swings in currency rates, which are frequently made worse by inflationary pressures.

The combined impact of exchange rate and inflation volatility on savings is still poorly understood, especially in the Nigerian context, despite substantial research on their individual effects. For example, periods of high inflation in Nigeria, like those seen in recent years, have affected consumer and company saving decisions by raising uncertainty about future policy responses. Furthermore, Nigeria is especially vulnerable to fluctuations in exchange rates due to its reliance on imports for basic raw materials, which have an impact on domestic prices, production costs, and saving habits.

This sensitivity emphasizes how important it is to comprehend the point at which changes in currency rates and inflation have a major impact on saving behavior. The current literature is unclear about this combined threshold effect because earlier research has mostly ignored the direct impact of inflation and exchange rates on domestic savings in favor of more general macroeconomic outcomes like stock market performance and economic growth. This study attempts to close the gap in the literature by investigating the asymmetric relationship between exchange rate volatility, inflation uncertainty, and savings in light of ongoing inflationary pressures and recent depreciations in Nigeria's exchange rate.

Through a thorough examination of these dynamics, the study seeks to shed light on the intricate connections between Nigeria's currency rates, inflation patterns, and saving habits, ultimately providing data-driven suggestions for financial inclusion and economic stability.

Literature Review

Since both exchange rate fluctuations and persistent inflation have an impact on saving habits, understanding the relationships between currency rates, inflation, and savings is crucial to understanding Nigeria's economic stability.

Changes in exchange rates affect actual returns on savings and inflationary pressures, which in turn affect how much money families and corporations save. This study uses an asymmetric approach, understanding that responses may differ, to examine the different effects of inflation variations and currency rate appreciation and depreciation. Many important economic ideas are taken into consideration, such as Miles Kimball's Precautionary Savings Theory, which argues that individuals should save more money during uncertain times to protect themselves from future economic shocks. Due to Nigeria's erratic inflation and exchange rates, households may increase savings in response to worries such as currency depreciation or rising costs. Because some people may prioritize current consumption out of fear for future depreciation, responses may also be inconsistent.

This demonstrates how fluctuations in currency rates and inflation can have opposing effects on savings. The LifeCycle Hypothesis (LCH) of Franco Modigliani and Richard Brumberg states that people plan their savings and consumption throughout the course of their lives in order to balance their income and spending. However, frequent inflationary pressures and currency rate fluctuations upset this equilibrium in Nigeria, forcing households to commit a higher amount of their income to present spending in order to protect themselves from future price increases. This modification contradicts the LCH assumption of stable consumption and illustrates how inflation and currency rate volatility may impact people's ability to save for the future.

Additionally, John Muth created the rational expectations hypothesis, which maintains that people adjust their savings and spending in response to their expectations on the future state of the economy. In Nigeria, where inflation and exchange rate swings are unpredictable, people may reduce their local currency savings in anticipation of currency depreciation and the loss of purchasing power.

According to Milton Friedman's Permanent Income Hypothesis (PIH), consumers should base their spending and saving decisions on their expected lifetime income. In Nigeria, inflation and currency rate fluctuation interrupt real income, causing consumers to prioritize current spending above future savings in order to minimize inflationary losses. By emphasizing how economic volatility, particularly inflation, affects saving habits, this deviation from the PIH challenges the consumption-smoothing behavior the theory assumes. The theories of rational expectations and permanent income also give light on how families adjust their savings and spending in response to erratic economic circumstances. All things considered, these concepts demonstrate how exchange rate volatility and inflation significantly alter saving behaviors, throwing doubt on the conceptions of consistent consumption and saving patterns.

Empirical Review

This empirical study provides an overview of previous studies on currency rates, inflation, and savings. It highlights how saving habits are impacted by inflation and exchange rate fluctuations. However, Chipote (2013) focuses on the years 1990-2011 and explores the primary factors influencing family savings in South Africa. The study looks at how savings are impacted by the age dependence ratio, household income, inflation, and real interest rates using quarterly data. The study used the Augmented Dickey-Fuller and Phillips-Perron tests to assess stationarity and Johansen co-integration with an Error Correction Mechanism (ECM) to examine short- and long-term dynamics. The study found that while inflation and interest rates have a positive effect on long-term savings, household income has a negative effect. However, the age dependence ratio was found to have little effect on savings. The study's skeptics claim that further current data and the addition of other elements could increase the robustness and dependability of the findings. Similar to this, Ajakaiye and Fakiyesi (2009) examine Nigeria's response to the 2008 financial crisis and emphasize the influence of inflation, currency rates, and savings. According to the analysis, the currency rate was weakened and inflationary pressures were raised by the loss of foreign reserves and the drop in oil prices. In an attempt to increase liquidity and stabilize the economy, the Nigerian government responded by lowering cash reserve requirements and the monetary policy rate. The study found that despite these efforts, the measures had minimal impact on family savings, primarily due to continued inflationary pressures. The findings hint to a shift toward supporting non-oil businesses like infrastructure and agriculture in order to support long-term prosperity. Emmanuel (2017) examines the impact of exchange rate deregulation on Nigeria's human capital development using data from 1986 to 2015. The study used the Augmented Dickey-Fuller and Phillips-Perron tests for stationarity and an Error Correction Model (ECM) for analysis. The findings demonstrate that exchange rate depreciation has an indirect effect on the development of human capital by increasing the financial demand for expenditure on health and education. This could lead to a decrease in the savings needed for public investment. The study highlights the need for more government financing for these areas in order to counteract the negative effects of inflation and currency rate volatility, which could reduce saving capacity.

Theoretical Framework

Miles Kimball's Precautionary Savings Theory states that families typically increase their savings to protect themselves from potential financial shocks, particularly during uncertain economic times like rising inflation or volatile currency rates. The desire to create a financial buffer in reaction to possible hazards is what drives this behavior. In a similar vein, O'Toole, McQuinn, and Economides (2021) looked at households in Europe and discovered that precautionary savings typically increase in response to perceived economic risks, such as financial constraints or instability. These studies also demonstrate how macroprudential interventions, evaluated using econometric models, might lessen the demand for precautionary reserves and assist stabilize the financial system.

$$SA_t = \alpha + \beta ER_t + \gamma GARCH_VARINF_t + \mu t \quad (1)$$

The rate at which savings occur at time t is represented by SA , the exchange rate at time t is captured by ER , the current inflation rate is represented by $GARCH_VARINF$, the parameters to be estimated are α , β , and γ , and the error term is represented by μ .

Model Specification

This study examines how exchange rate (ER) and inflation uncertainty, expressed as conditional variance ($GARCH_VARINF$), impact Nigerians' saving behavior in accordance with the theoretical framework previously explained through the use of Autoregressive Distributed Lag (ARDL) techniques. The model uses a Nonlinear Autoregressive Distributed Lag (NARDL) test to investigate the asymmetric effects of these variables, where SA stands for savings, ER for exchange rate, $GARCH_VARINF$ for inflation uncertainty, t for period, and U is the stochastic error term. This paper models the conditional variance of inflation using a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) framework, namely a GARCH (1,1) model, to account for inflation uncertainty. The following is the GARCH(1,1) specification:

$$h_t = \omega + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} \quad (2)$$

where ω , α , and β are parameters estimated under the conditions $\omega > 0$, $\alpha \geq 0$, and $\beta \geq 0$; ε_{t-1}^2 is the lagged squared residual (shock term), and h_{t-1} is the lagged conditional variance (persistence term). The NARDL model incorporates the computed conditional variance as a stand-in for inflation uncertainty. To guarantee stationarity and improve interpretability, logarithmic transformations of the variables ($\ln(SA)$, $\ln(ER)$, and $\ln(GARCH_VARINF)$) are employed. The NARDL model uses positive and negative partial sum decompositions to describe the following short- and long-term asymmetric effects:

$$\Delta \ln(SA_t) = \alpha + \sum \phi_{1i} \Delta \ln(ER_{t-i}^+) + \sum \phi_{2i} \Delta \ln(ER_{t-i}^-) + \sum \phi_{3i} \Delta \ln(GARCH_VARINF_{t-i}^+) + \sum \phi_{4i} \Delta \ln(GARCH_VARINF_{t-i}^-) + \lambda ECT_{t-1} + \varepsilon_t \quad (3)$$

where $GARCH_VARINF^+$ and $GARCH_VARINF^-$ are positive and negative decompositions of inflation uncertainty, Δ is the first-difference operator, and ER^+ and ER^- are positive and negative decompositions of the exchange rate. λ is the coefficient of the error correction term, which is represented by the term ECT_{t-1} and captures the rate of adjustment to the long-run equilibrium. The null hypothesis ($H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$) of cointegration is evaluated against the alternative in the limits test. Cointegration, which shows a long-term equilibrium link between savings, exchange rate, and inflation uncertainty, is achieved if the F-statistic is greater than the upper critical bound. Shin and Greenwood-Nimmo (2014) created the NARDL technique, which is especially useful for identifying asymmetric influences in both short- and long-term interactions. As highlighted by Romilly et al. (2001) and Zakari and Umar (2020), it is robust for smaller sample sizes since it can also handle variables that are stationary at $I(0)$, $I(1)$, or a combination of both. This concept is especially pertinent to Nigeria, where saving behavior is greatly impacted by severe currency rate volatility and ongoing inflation fear. The paper offers a comprehensive understanding of the dynamics of savings, exchange rates, and inflation uncertainty in the Nigerian setting by adding inflation uncertainty using the GARCH model and analyzing asymmetries using the NARDL framework.

Table 1: Measurement of Variables and Sources of Data

S/N	Variables	Measurement	Sources of Data
1	Savings (LSA)	This is calculated as the percentage of income set aside over a given period, reflecting the proportion of income that remains unspent.	The data was sourced from Central Bank of Nigeria statistical bulletin.
2	Exchange Rate (ER)	It is measured in domestic currency units per foreign currency unit (e.g., NGN/USD).	The data is obtained from Central Bank of Nigeria statistical bulletin.
3	Inflation Uncertainty (GARCH_VARINF)	Inflation uncertainty can be measured using the GARCH(1,1) model, where the conditional variance (ht) from the model captures time-varying volatility in inflation data.	The data was sourced from Central Bank of Nigeria statistical bulletin.

Descriptive Statistics

This section offers a comprehensive descriptive analysis that encompasses variance indicators and central tendency measures (mean and median) to give a fundamental understanding of the properties of the data before time series analysis. In Table 2, the average values for Exchange Rate (ER), Inflation Uncertainty (GARCH_VARINF), and Savings (LSA) are 1.0086, 97.3256, and 2.0200, respectively. A likely normal distribution is indicated by closely matching median values, which is an important indicator of reliable data behavior for predictive modeling. With the biggest standard deviation (12.9499), inflation is especially erratic, reflecting underlying economic instability. Additional information on tail thickness and distribution symmetry is provided by these skewness and kurtosis measures, which are essential for calculating the Jarque-Bera test to verify normalcy. According to Akinlo (2012), the positively skewed distributions of ER, GARCH_VARINF, and LSA exhibit a trend for higher values, although the platykurtic nature of LSA forecasts a flatter distribution. This provides a more complex picture of data dispersion and likely outliers. These descriptive statistics are crucial for assessing the reliability and stability of data, which forms the basis of trustworthy time series analysis.

Table 2: Descriptive Statistics

Variables	ER	GARCH_VARINF	LSA
Mean	1.008558	97.32558	2.020000
Median	0.990000	97.00000	1.900000
Maximum	1.600000	135.0000	2.770000

Minimum	0.790000	78.00000	1.190000
Std. Dev.	0.147198	12.94994	0.446228
Skewness	2.230225	0.697572	0.115616
Kurtosis	9.752402	3.174945	1.811096
Jarque-Bera	117.3372	3.542186	2.628306
Probability	0.000000	0.170147	0.268702
Sum	43.36800	4185.000	86.86000
Sum Sq. Dev.	0.910023	7043.442	315.7969
Observations	43	43	43

Source: Author's computation, 2024. Note: the sample period ranges from 1981–2023.

Unit Root Test

As is widely recognized in the literature, the majority of time-series data are non-stationary at levels due to extreme values that impede mean reversion. This necessitates the use of unit root or stationarity tests in time-series analysis. In this work, we assess stationarity using the Phillips-Perron (PP) test (Phillips & Perron, 1988) and the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1981), which takes intercepts and linear trends into account (Spiru & Qin, 2016). The results, which are shown in Table 3, are necessary for reliable time series and cointegration analysis. This helps prevent erroneous regression results. Thus, the absence of a unit root indicates stationarity and its presence indicates non-stationarity.

Since the limits test presupposes that variables are $I(0)$ or $I(1)$, the investigation verified that none of the variables were integrated of order two (Pesaran et al., 1999; Ouattara, 2004). As shown in Table 3, the ADF test findings show that savings (LSA), inflation (INFR), and exchange rate (ER) are stationary at initial differences ($I(1)$). The absolute values of these variables at level (2.8 for ER, 2.9 for INFR, 2.04 for LSA, and 0.9) were higher than the 5% required value in order to demonstrate non-stationarity at levels. After differencing, their significance at the 5% level was determined. However, the PP test findings show that while savings (LSA) and inflation (INFR) are stationary at initial discrepancies, the exchange rate (ER) is stationary at level ($I(0)$).

Table 3: Unit Root Test

Variables	ADF Test — Level	ADF Test — 1st Difference	ADF Test — Status	PP Test — Level	PP Test — 1st Difference	PP Test — Status
ER	-2.810694 (1.0000)	-4.402390 (0.0011)*	$I(1)$	-3.05680 (0.0378)*	—	$I(0)$
INFR	-2.890089 (0.1761)	-5.336786 (0.0004)*	$I(1)$	-2.612994 (0.2769)	-5.336786 (0.0004)*	$I(1)$
LSA	-2.037014 (0.5642)	-5.103001 (0.0009)*	$I(1)$	-1.775239 (0.6988)	-4.986759 (0.0012)*	$I(1)$

Source: Author's computation, 2024.

Note: (a) figures in parentheses are probability values; (b) "*" denotes level of significance at 5%; (c) ER is exchange rate; (d) INFR is inflation rate; (e) LSA is log of savings; (f) INR is interest rate; (g) LIMP is log of import price; (h) LM2 is money supply.

Discussion of Findings

Table 4's results for the current positive cumulative change in inflation uncertainty, as determined by the GARCH-based conditional variance of inflation (@DCUMDP(GARCH_VARINF)), revealed a coefficient of -0.0232 (t-statistic of 2.18, $p=0.0447$), suggesting that rising inflation uncertainty has a negative effect on savings.

A floating currency rate, hefty import taxes, agricultural insecurity, fluctuating oil prices, supply chain disruptions, and various government policies are some of the main causes that exacerbate Nigeria's erratic inflation. For example, rising food costs force households to spend more on immediate consumption, which lowers savings. Food scarcity for Nigeria's expanding population has gotten worse due to inflation uncertainty brought on by food shortages and insecurity, which has resulted in displaced farmers and decreased agricultural productivity. High taxes and import restrictions also lead to "imported inflation," which raises prices for commodities that are highly sought after because of the perceived superior quality of imported goods.

This asymmetrical relationship demonstrates how households are forced to reallocate income toward requirements due to inflation uncertainty, significantly depleting savings during times of price increases. Information from Nigeria's inflationary period (2021–2023), when rates were higher than 20%, demonstrates a 5-7% decline in household savings as opposed to greater savings rates during the 2016–2018 period of low inflation, which averaged about 12% (CBN, 2023). In order to combat declining purchasing power and income erosion, households prioritize their immediate needs, as supported by the Precautionary Savings Model (Friedman, 1977; Kimball, 1990).

In keeping with worldwide results on the short-term impacts of inflation uncertainty, empirical studies like Mordi et al. (2013) demonstrate that inflation spikes in Nigeria cause immediate losses in family savings. Additionally, according to Modigliani and Brumberg's (1954) Life-Cycle Hypothesis (LCH), unpredictable inflation disturbs optimal lifetime consumption-savings allocations, leading to greater current spending as a hedge against future price volatility (Trahan & Krantz, 2011). Similarly, Dybczak et al. (2023) discovered that short-term reductions in inflation uncertainty do not cause priorities to move toward savings in economies with variable inflation. Stable inflation expectations are essential for promoting long-term savings, according to their analysis. Similarly, Opoku (2020) noted that in developing economies with ongoing structural issues, short-term decreases in inflation anxiety do not considerably boost savings. These studies highlight how crucial it is to deal with systemic economic instability and build trust in long-term inflation control in order to promote saving.

A solid explanation for this occurrence can be found in theoretical frameworks like Milton Friedman's (1957) Permanent Income Hypothesis (PIH). The PIH claims that rather than relying only on present income, people base their decisions about savings and spending on projected lifetime income. People may eventually feel more sure about their financial future and start saving more when inflation uncertainty gradually decreases. This is consistent with observed behaviors in Nigeria, where past inconsistencies in policy responses have made it difficult for economic stability to translate into higher consumer confidence.

Empirical research corroborates this interpretation.

According to Ghosh and Phillips (1998), people prefer to save more when inflation uncertainty is consistently reduced because they start to believe that the economy will be stable. This realization is especially pertinent to Nigeria, where uncertainty has historically been caused by the government's erratic reactions to inflation. Additionally, Chater et al. (2010) noted that consumers usually need a prolonged period of stable economic conditions before making significant changes to their financial practices, underscoring the significance of long-term stability in influencing saving behavior. Nonetheless, the lagged negative cumulative change in the exchange rate (@DCUMDN (ER (-3)) displays a coefficient of -0.8370 (t-statistic:-2.71, p=0.0155), suggesting that previous currency depreciations significantly deter saving behavior.

Due to its significant reliance on oil exports, Nigeria's economy is extremely vulnerable to changes in the price of oil globally, which has an immediate effect on foreign exchange reserves and the value of the Naira. In addition to raising the price of imported items, the Naira's dropping value raises doubts about the currency's future viability. People may be more likely to spend than conserve in the face of such uncertainty because they anticipate additional depreciation.

Expectations of impending economic reforms or political unpredictability can make this behavior worse by undermining consumer confidence. Because of previous depreciations, people become more cautious and anticipate additional declines, as this asymmetrical relationship demonstrates. The idea that negative shocks, such inflation or currency depreciation, have more deep effects on saving behavior than positive shocks is supported by the detrimental influence of previous exchange rate fluctuations on current savings. A useful foundation for comprehending this behavior is offered by the Precautionary Savings Theory. The idea that currency fluctuation reduces savings by raising uncertainty is supported by research on emerging markets.

Research conducted in a number of African countries has demonstrated that currency rate volatility erodes public trust and causes consumer to modify their buying patterns in preparation for future depreciation (Dornbusch, 2001). Empirical studies demonstrate how inflation and exchange rate fluctuations affect household savings. Feldstein (2008), for instance, discovered that exchange rate volatility in Nigeria dramatically changes consumption patterns because consumers react to a declining currency by buying items right away rather than saving. In a similar vein, Aron et al. (2014) noted that in nations with volatile currencies, exchange rate depreciation frequently results in a short-term decline in savings rates.

Table 4: Non-Linear Relationship among Exchange Rate, Inflation and Savings

Variable	Coefficient	Std. Error	t-Statistic	Prob.
@DCUMDP(GARCH VARINF)	-0.023217	0.010660	-2.178029	0.0447
@DCUMDN(GARCH VARINF)	-0.024188	0.008538	-2.833154	0.0120
@DCUMDN(GARCH_VARINF(-3))	0.025796	0.008282	3.114645	0.0067
@DCUMDN(ER(-3))	-0.836972	0.308992	-2.708718	0.0155

Diagnostic	Value
R-squared	0.929535
Adjusted R-squared	0.837049
S.E. of regression	0.064934
Sum squared resid	0.067462
Log likelihood	66.42209
F-statistic	10.05060
Prob(F-statistic)	0.000011
Mean dependent var	0.022895
S.D. dependent var	0.160858
Akaike info criterion	-2.338005
Schwarz criterion	-1.389928
Hannan-Quinn criter.	-2.000686
Durbin-Watson stat	2.083868

Source: Author's computation, 2024.

Conclusion

The study's conclusions highlight how asymmetrically currency rate volatility, inflation uncertainty, and savings are related in Nigeria. According to the NARDL model, savings are immediately negatively impacted by inflation uncertainty, but long-term worries about economic instability prevent saves from increasing when uncertainty is reduced. Similarly, past currency depreciations continue to discourage savings behavior. The findings are in line with theories like the Life-Cycle Hypothesis and the Precautionary Savings Model, which contend that household savings decisions are heavily influenced by both past and present economic concerns. These findings show that in order to promote saving behavior in Nigeria, more stable and predictable economic policies are required.

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