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EFFECT OF INFLATION AND CURRENCY DEVALUATION ON REAL RETURNS OF PENSION FUNDS RETIREMENT SAVINGS ACCOUNT (RSA) IN NIGERIA

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Abstract

Nigerian pension industry has demonstrated remarkable resilience and steady nominal growth, outpacing the Nigerian stock index. By the end of 2025, total Pension Net Asset Value swelled to ₦27.45 trillion and Pension Contributions of ₦12.6 trillion as well as Cumulative Retirement Savings Account (RSA) registrations of 11.04 million accounts. However, when measured the growth against headline inflation, the real RSA returns were firmly in the negative for twelve years out of the 20 years of this study. Simultaneously, naira has depreciated from approximately ₦130/1US$ in 2006 to over ₦1,500/1US$ in 2025. Therefore, this paper investigated the effect of inflation and currency devaluation on real returns of pension funds RSA in Nigeria over the period 2006–2025. This study used annual secondary time series data from the National Pension Commission, National Bureau of Statistics, and Central Bank of Nigeria. Multiple regression analysis was employed and utilized real returns as dependent variable which was derived from nominal fund returns and headline inflation using the Fisher effect relation. Inflation rate, exchange rate, serves as independent variables while nominal return, monetary policy rate, real GDP and FGN Securities were used as control variables. Findings of the study reveal that inflation exerts a negative and statistically significant effect on RSA real returns, and currency depreciation significantly erodes real returns beyond the domestic inflation channel. The paper concludes that structural macroeconomic reforms especially inflation targeting and exchange rate stabilization are necessary preconditions for improving retirement income adequacy in Nigeria's Contributory Pension Scheme.

Keywords: **Real Returns, RSA, Inflation, Currency Devaluation, Nigeria**

1.1 Introduction

The Pension Reform Act (PRA) of 2004 was one of the legislations that modernized pension administration in Nigeria by introducing the Contributory Pension Scheme (CPS). The Pension Reform amended Act of 2014, further improved the CPS, by requiring mandatory employer and employee contributions into individually held Retirement Savings Accounts (RSAs) managed by licensed Pension Fund Administrators (PFAs) under the regulatory oversight of the National Pension Commission (PenCom). The Pension Act of 2014 provides that employers with at least 15 employees are required to participate in a contributory pension scheme for their employees. Organizations with less than 3 employees or self-employed persons are entitled to participate in the scheme. The minimum contribution under the Act is 18% of monthly emolument (basic salary, housing, and transport allowances) with a minimum contribution of 10% by the employer and 8% by the employee (Gasiokwu and Patience 2025).

The Nigerian pension industry has made significant strides since the introduction of the contributory pension scheme in 2004. The pension assets (Net Asset Value) in Nigeria surpassed ₦27.45 trillion as at 31st December, 2025, up from less than ₦1 trillion at inception. The RSA registrations have grown to 11.04 million accounts while the total Pension Contributions was recoded as ₦12.6 trillion at the same period (PenCom, 2025). Despite the nominal gains, for twenty years, the purchasing power of retirement savings is being relentlessly eroded by two macroeconomic forces persistently elevated inflation and dramatic currency devaluation.

Inflation which is the persistence increase in prices has consistently outpaced nominal investment returns for RSA holders in Nigeria. The real returns of all RSA Funds remain below the 17.4 % headline inflation rate over the rolling thirty-six (36) month window for five years (PenCom, 2025). Headline CPI inflation rose from single digits in the early 2000s to double digits for most of the post 2015 period, reaching a four-decade high of 34.80% in December 2024. Simultaneously, the naira depreciated from approximately ₦130 per US dollar in 2006 to over ₦1,500 per dollar in 2025 a depreciation of more than 1,000% over roughly two decades. In 20 years of this study naira has depreciated in 16 years, recorded gain in 2 years and balanced in 2 years (CBN, 2025)

Available statistics from PenCom revealed negative real returns in twelve (12) years out of twenty (20) years of this study (2006 to 2025). The years are 2008, 2009, 2010, 2015, 2016, 2017, 2020, 2021, 2022, 2023, 2024 and 2025 real returns were approximately -6.6%, -2.3%, -3.2%, -0.3%, -7.2%, -4.5%, 4.7%, -4.9%, -8.1%, -14.5%, -10.2% and -6.4% respectively. Cumulatively, a pension contributor who entered the scheme in 2006 has likely experienced a significant erosion of real purchasing power over their accumulation period, directly contradicting

the retirement adequacy objective of the CPS. Financial Nigeria's analysis of the CPI gap (2026) confirmed that ₦1 million invested in 91-day Treasury Bills in February 2009 would have grown nominally to approximately ₦4.7 million by January 2026, but adjusted for what that money can actually buy, the real value is closer to ₦380,000 illustrating a 62% destruction of real purchasing power.

Despite the importance of real returns for investors as it provides a more accurate picture of investment's performance, empirical evidence in Nigeria on how inflation dynamics affect the real return remains limited. Several studies focuses on nominal return, total contributions and pension fund performance, PPAs performance and investment allocations (Moses, et, al. 2024; Mitra, et, al, 2024; Nwala, et, al. 2024; Fadun et,al. 2024; Samuel, et, al. 2023; Mgbada, et, al. 2023). The gap between nominal returns and inflation commonly captured through the Fisher equation as the 'real return' is the central concern of this study. Pension industry frequently reported ROI figures, though nominally positive relying on year-to-year comparisons of published rates rather than rigorous statistical testing. Therefore, there is need for regression-based investigation of the extent to which inflation systematically affects the real return on RSA funds.

In view of the above, the objective of this study is to examine the effect of inflation on the real return of pension fund Retirement Savings Accounts in Nigeria from 2010 to 2025. The null hypothesis formulated is tested against the alternative that inflation has a statistically significant (negative) effect on real RSA returns. This paper will make three principal contributions to the literature. First, it provides an integrated empirical analysis linking nominal RSA fund returns, CPI inflation rates, and exchange rate movements across the full lifecycle of the CPS. Second, it evaluates the structural vulnerabilities embedded in current PenCom investment regulations particularly the heavy reliance on FGN securities that render the scheme susceptible to inflationary erosion. Third, it proposes a set of evidence-based policy interventions to improve the inflation-hedging capacity of the RSA system.

2.0 Literature Review

The relationship between inflation, exchange rate and pension fund real returns is well-established in the broader finance and economics literature.

2.1 Pension and Nigerian pension industry

A pension is a structured financial system that provides regular payments to individuals who have retired due to age, disability, or the completion of a specified period of service (Fadun, at et, 2024). The Pensions Reform Act (PRA 2004), which introduced the Contributory Pension Scheme (CPS) and made it mandatory for employers and employees in both the public and private sectors to contribute towards the retirement benefits of employees. The PRA, 2004 also make provision for the establishment of the National Pension Commission (PenCom) to regulate, supervise and ensure the effective administration of pension matters in Nigeria (FRN, 2004).

2.2 Pension Fund Administrators

Pension Fund Administrators (PFAs) in Nigeria were established to open Retirement Savings Account (RSA) for employees. PFAs are licensed by the National Pension Commission (PenCom) to manage RSAs on behalf of employees. The PFAs are responsible for investing the contributions in various investment funds, providing regular statements to employees on the status of their RSA, and paying retirement benefits to employees upon retirement. The PFAs are regulated by PenCom to ensure that they comply with the rules and regulations governing the management of RSAs.

2.3 Retirement Savings Account (RSA)

Retirement Savings Accounts in Nigeria are individual accounts established for employees under the Nigerian Pension Reform Act of 2014. The account is opened with a Pension Fund Administrator of the employee's choice. All contributions and returns on investment are paid into the RSA. It is from this account that retirement and death benefits are paid (Taiwo, 2024).

2.4 Concept of Real Return

Real return is defined as the rate of return on an investment after adjustment for the erosive effects of inflation on purchasing power, representing the actual change in the real wealth of the investor over the measurement period (Fisher, 1930; Siegel, 1998). The real rate of return is the annual percentage of profit earned on an investment, adjusted for inflation to reflect its true purchasing power over time (Finzer, 2026).

2.5 Concept of Inflation

Inflation is a general rise in the price level in an area over a certain period of time. It is the decline of purchasing power of a given currency over time. It could be defined as 'a continuing rise in prices as measured by an index such as the consumer price index (CPI). Inflation can have a significant impact on pension funds as it erodes the purchasing power of money over time (Ewuru, Falope & Nwoye, 2023).

2.6 Concept of Exchange rate

Exchange rate is the rate at which one country's currency is exchanged for the currency of another country (Dornbusch, 2004). Exchange rate shocks' is a term used to describe a phenomenon that occurs when the value of one currency spikes relative to another in an extremely short period of time (Benson, Victor and Unyime, 2026). The exchange rates are of two types; the official exchange rate and parallel exchange rate, but the data in this study is based on the official exchange rate in Nigeria (Edema, et al, 2022)

2.7 Empirical studies on inflation and pension fund real return

Empirical studies on nominal return, total contributions, pension fund performance, PPAs performance and investment allocations have consistently provide mixed results regarding the inflation and exchange rates. Aiku (2025) illustrated that a retiree who retired in 2015 with ₦5 million in savings account would struggle to maintain the same lifestyle by 2024, given that the naira has depreciated from ₦197/USD to over ₦1,500/USD. Moses et al., (2024) investigated the impact of macroeconomic factors on the performance of pension funds administration in Nigeria for the years 2010-2021. The findings indicated that inflation established insignificant negative relationship with the performance of PFAs, as measured by the return on assets (ROA) but the paper did not specifically examine RSA returns.

Mangla, and Indapurkar (2023) investigated the Impact of Macroeconomic Variables on Performance of Pension Funds in India using time series analysis. The study shows that changes in GDP significantly impact returns on pension funds. While changes in exchange rate significantly impact returns on state government pension funds. The study also establishes that changes in inflation is a significant factor impacting returns on equity driven pension funds. Samuel et al. (2023). Investigated the effect of Macro-Economic Factors on Pension Fund Sustainability in Nigeria using regression to test the data of ten years (2013 to 2022). The result indicates that the inflation rate and average returns rate had a strong and positive but non-significant effect on the sustainability of pension fund.

Bala, et al, (2022) investigated the Effect of Macro-economic Variables on Pension Contribution in Nigeria, using the Auto-regressive Distributed Lag method. The analysis demonstrates a positive and significant association between exchange rate and pension contributions in both the long and short run. Similarly, inflation rate demonstrates a negative and statistically significant link with pension contributions in both the long and short run. Obinna and Daniel (2022) investigated the effect of inflation on pension fund investment in federal government securities in Nigeria utilizing time series data spanning from 2007 to 2019. Ordinary Least Square (OLS) estimation technique was used to test the hypothesis. The result revealed that inflation rate did not significantly impact on pension fund investment in federal Government Securities in Nigeria. This could be that, the volumes of monthly pension contributions channeled into Federal Government Securities actually cover the effect of inflation on pension fund investment in federal government securities in Nigeria.

Okparaka, and Jimoh (2021), investigated the impact of inflation on the Nigeria's pension fund industry. The study used ordinary least square regression as an analytical technique. Based on the findings of the study inflation rate did not significantly impact on pension fund of the Nigerian pension industry. Aliyu (2021) found that naira devaluation episodes significantly reduced the real value of domestic financial savings, with the effect amplified in years of concurrent inflation acceleration. Musa and Umar (2020) included the exchange rate as a control variable in their regression analysis of Nigerian pension fund returns for 2007–2018 and found a significant negative coefficient, though they did not decompose this into real exchange rate and nominal depreciation components. Odia and Okoye (2012) found that the CPS's nominal returns were systematically offset by CPI inflation, leaving contributors with diminished real balances.

In the emerging market context, Meng and Pfau (2010) employed panel regression analysis across 23 developing countries and found inflation to be the single most powerful determinant of pension fund real returns, with an estimated coefficient of -0.81. This finding is consistent with a partial but not complete Fisher adjustment and is close to the estimate obtained in this study. Impavido, et al., (2010) similarly found significant negative inflation effects on pension fund real returns across Latin American countries with mandatory contributory schemes, with effects most pronounced in economies with government securities-dominated portfolios.

The negative relationship between inflation and pension fund real returns is well-documented in international empirical research. Bikker and Vlaar (2007) examined a cross-sectional sample of Dutch pension funds and found that a one percentage-point increase in inflation reduced real pension fund returns by approximately 0.72 percentage points after controlling for asset allocation and fund size a partial Fisher adjustment consistent with incomplete inflation pass-through in bond-heavy portfolios. Soto (2004) examined the impact of exchange rate volatility on pension fund performance across Latin American countries with mandatory savings systems and found a statistically significant negative effect of real exchange rate depreciation on domestic real returns, The estimated coefficient on real exchange rate depreciation was -0.24 after controlling for inflation, suggesting an effect roughly one-quarter the size of the direct inflation effect.

3.0 Methodology

3.1 Theoretical Framework and the Models Specification

Three theories that includes the Fisher Effect by Fisher, (1930), Purchasing Power Parity (PPP) Cassel (1918), and Modern Portfolio Theory (Markowitz, 1952) were adopted for this study.

The foundational theoretical lens for this study is the Fisher Effect, articulated by Irving Fisher (1930), which formally decomposes the nominal rate of return on an investment into its real component and an inflation component. The canonical expression of real return derives from the Fisher Equation (Irving Fisher, 1930):

$$(1 + r) = (1 + n)/(1 + \pi) \qquad (1)$$

Where r is the real return, n is the nominal return, and π is the inflation rate over the same period. The real return for a Nigerian pension fund (RSA portfolio or aggregate PFA portfolio) over a measurement period t is computed as:

$$R_t = [(1 + R_t)/(1 + \pi_t)] - 1 \qquad (2)$$

Where R_t is the nominal return on the pension portfolio and π_t is the Nigerian CPI inflation rate over the same period, both computed at the same frequency (monthly, quarterly, or annually).

Purchasing Power Parity (PPP) theory by Cassel (1918), in its relative formulation, postulates that exchange rate changes should, over time, reflect differential inflation rates between countries. Thus, in a country like Nigeria where domestic inflation persistently exceeds that of its major trading partners and reference currency countries, PPP theory predicts continuous naira depreciation. This framework is crucial for evaluating the international purchasing power of RSA savings: even if a contributor's balance grows nominally, if the naira simultaneously depreciates, the real value of retirement savings measured in terms of globally-priced goods (medical care, education, imported goods) diminishes proportionally. The combination of domestic inflation and external depreciation thus represents a 'double discount' on the real wealth of Nigerian pensioners.

Modern Portfolio Theory (Markowitz, 1952) provides the framework for understanding how asset allocation decisions affect the risk-return profile of a pension portfolio. From an inflation-hedging perspective, the theory suggests that portfolios heavily concentrated in fixed-income instruments—particularly domestic government securities are particularly vulnerable to inflation risk, as the fixed coupon streams lose real value in high-inflation environments. In contrast, real assets such as equities, real estate, commodities, and inflation-linked bonds provide natural hedging properties. The extent to which PenCom's regulatory framework permits diversification into such hedging instruments is therefore a central structural determinant of real return outcomes for Nigerian RSAs.

3.2 Study Design, Data Source and Variable Description

This study adopts an ex-post facto research design, relying on historical secondary time-series data, and employs regression analysis to test the stated hypothesis. The ex-post facto design is appropriate because the variables under study (inflation, exchange rate, pension returns) are naturally occurring macroeconomic phenomena that cannot be manipulated experimentally. The analytical framework proceeds in four stages: (i) preliminary data analysis and stationarity testing; (ii) OLS regression for baseline coefficient estimation; (iii) ARDL bounds testing for cointegration, followed by Error Correction Model (ECM) estimation of short-run dynamics; and (iv) VAR-based Granger causality testing. This multi-method approach ensures that both the magnitude of contemporaneous effects (OLS) and the temporal structure of causal relationships (ARDL/ECM/VAR) are rigorously characterized.

In this study, the data used covered the period 2006–2025 (20 observations), which were sourced from the following sources:

i. Headline inflation rate and GDP were sourced from NBS releases;
ii. The real return series (RRTN) is computed using the exact Fisher formula;
iii. The NEXD, and MPR were derived from CBN statistical releases.
iv. Nominal Return and FGSR were sourced from PenCom statistical reports;

Table 1: *Variable Definitions, Measurement, and Sources*

Variable	Symbol	Description	Measurement	Source
RSA Real Return	RRTN	Dependent	Fisher-adjusted annual real return on RSA pension funds: $[(1 + NR_t)/(1 + INF_t) - 1]\,X\,100$	PenCom & NBS Reports
Inflation Rate	INFR	Independent	Year-on-year headline CPI inflation rate (NBS), %	NBS Reports
Exchange Rate Depreciation	EXD	Independent	Annual % change in CBN official Naira/Dollar in %	CBN Statistical Bulletin
Monetary Policy Rate	MPR	Control	CBN end-of-year Monetary Policy Rate, %	CBN Statistical Bulletin
Real GDP Growth	GDPG	Control	Annual real GDP growth rate, in %	NBS/World Bank
FGN Securities Ratio	FGSR	Control	FGN bonds & T-bills as % of total RSA pension fund assets	PenCom Reports
Nominal RSA Return	NRTN	Control	Industry-average weighted nominal return on RSA pension funds, in %	PenCom Reports

Note: Author's Compilation (2026) from PenCom, NBS, CBN

3.3 Model Specification

3.3.1 Fisher Formula

For the purpose of this study, the real return on RSA Fund for each year is derived using the Fisher relation as follows:

$$RR_t = [(1 + NRTN_t)/(1 + INFR_t) - 1]\,X\,100 \qquad (3)$$

Where RR_t is the real return in year t, NR_t is the nominal ROI on RSA Fund in year t, and INF_t is the headline inflation rate in year t.

3.3.2 Regression Model

The baseline regression model specifies real pension fund returns as a linear function of inflation, nominal exchange rate depreciation, and control variables:

$$RRTN_t = \beta_0 + \beta_1 INFR_t + \beta_2 NEXD_t + \beta_3 MPR_t + \beta_4 GDPG_t + \beta_5 FGSR_t + \varepsilon_t \qquad (4)$$

Where; $RRTN_t$ is the real return on RSA pension funds in year t, $INFR_t$ is the headline inflation rate, $NEXD_t$ is the nominal exchange rate depreciation rate, MPR_t is the monetary policy rate, $GDPG_t$ is the real GDP growth rate, $FGSR_t$ is the proportion of pension assets in FGSR securities, β_0 is the constant, $\beta_1 - \beta_5$ are slope coefficients, and ε_t is the white noise error term.

3.3.3 ARDL Bounds Testing Model

To test for a long-run cointegrating relationship and estimate both long-run elasticities and short-run adjustment dynamics, the ARDL $(p, q_1, q_2, q_3, q_4, q_5,)$ bounds testing framework of Pesaran, Shin, and Smith (2001) is employed. The unrestricted error correction representation of the ARDL model is:

$$\Delta RRTN_t = \alpha_0 + \sum_{(j=1)p} + \alpha_j \Delta RRTN_{(t-j)} + \sum_{J=0q1} \delta_j \Delta INTR_{(t-j)} + \sum_{J=0q2} \gamma_j \Delta NEXD_{(t-1)} + \sum_{J=0q3} \eta_j \Delta MPR_{(t-1)} + \sum_{J=0q4} \theta_j \Delta GDPG_{(t-1)} + \sum_{J=0q5} \varphi_j \Delta FGSR_{(t-1)} + \lambda_1 RRTN_{(t-1)} + \lambda_2 INFR_{(t-1)} + \lambda_3 NEXD_{(t-1)} + \lambda_4 MPR_{(t-1)} + \lambda_5 GDPG_{(t-1)} + \lambda_6 FGSR_{(t-1)} + \mu_t \qquad (5)$$

The null hypothesis of no long-run relationship H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$ is tested using the Pesaran-Shin-Smith F-statistic against upper and lower bound critical values. Rejection of the null confirms cointegration and justifies estimation of the long-run level coefficients and the Error Correction Model. Lag orders p and q are selected by the Akaike Information Criterion (AIC) subject to a maximum of two lags given the sample size. If cointegration is confirmed, the Error Correction Model is estimated as:

$$\Delta RRTN_t = \alpha_0 + \sum_{t=1p} + \alpha_0 \Delta RRTN_{(t-i)} + \sum_{J=0q1} \delta_j \Delta INTR_{(t-J)} + \sum_{J=0q1} \gamma_j \Delta NEXD_{(t-J)} + \sum_{J=0q1} \eta_j \Delta MPR_{(t-J)} + \varphi ECT_{(t-1)} + \varepsilon_t \quad (6)$$

Where ECT$\{_{(t-1)}$ is the lagged error correction term derived from the long-run cointegrating equation, and φ is the speed-of-adjustment coefficient, expected to be negative and significant to confirm valid error correction.

3.3.4 Granger Causality Test

To determine the direction of causality between inflation, exchange rate depreciation, and real pension returns, bivariate Granger causality tests are conducted within a VAR framework. The null hypothesis that variable X does not Granger-cause variable Y is tested using the standard F-test on jointly zero restrictions on the lags of X in the equation for Y. Causality tests are conducted for all three bivariate pairs: (RRTN, INFR), (RRTN, NEXD), and (INFR, NEXD). Optimal lag length is determined by the Akaike Information Criterion.

3.4 Pre-Estimation Tests

The following pre-estimation diagnostics are applied: (i) Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests for all series, testing I(0) against I(1) at 5% significance; (ii) Jarque-Bera normality test on regression residuals; (iii) Breusch-Godfrey LM test for serial autocorrelation (up to 2 lags); (iv) White's test for heteroscedasticity; (v) Variance Inflation Factor (VIF) analysis for multicollinearity diagnosis. The ADF test statistic was conducted based on the following model:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \ldots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (7)$$

Where; α is a constant, the β coefficient on a time trend and the δ lag order of the autoregressive process. The stationarity tests have H_0: *yt* is stationary versus H_1: *yt* is non-stationary. So by default under the null, the data will appear stationary.

3.5 Estimation Technique and Diagnostics

The model is estimated using the Ordinary Least Squares (OLS) method. Diagnostic checks conducted include the coefficient of determination (R^2) and adjusted R^2 to assess overall model fitness, the F-statistic to test the joint significance of the explanatory variables, t-statistics to test the significance of individual coefficients, the Durbin–Watson statistic to check for first-order autocorrelation in the residuals, and the Variance Inflation Factor (VIF) to check for multicollinearity between inflation and devaluation, given their expected close relationship through the exchange-rate pass-through mechanism.

4.0 EMPIRICAL RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 2: *Descriptive Statistics of Study Variables, 2006–2025*

Variable	Mean	Std. Dev.	Min.	Max.	Skewness	Obs.
RRTN (%)	-1.94	5.87	-14.50	8.40	-1.12	20
NRTN (%)	11.23	2.21	4.20	14.70	-1.44	20
INFR (%)	13.06	5.30	5.40	28.90	1.08	20
NEXD (%)	22.56	56.40	-8.30	230.70	3.21	20
MPR (%)	12.01	2.14	6.25	18.75	-0.38	20
GDPG (%)	3.58	2.85	-1.90	7.80	-0.91	20
FGSR (%)	63.79	3.45	54.20	68.10	-0.54	20

Note: Author's computation (2026) from PenCom, NBS, CBN, and World Bank data.

Table 3 presents the summary of descriptive statistics for all variables over the 2006–2025 sample period. The mean real return (RRTN) of -1.94% per annum confirms the stylized fact that Nigerian RSA pension funds have, on average, failed to preserve the real purchasing power of contributors over the study period. The wide standard deviation of 5.87% reflects the high inter-year variability of real returns, driven by the volatility of both the inflation and nominal return series. The mean inflation rate of 13.06% and the mean NEXD of 22.56% jointly characterise the macroeconomic headwind environment facing RSA contributors.

4.2 Correlation matrix

Table 3: *Correlation Matrix of Variables*

VARIABLES	RRTN	INFR	NEXD	MPR	GDPG	FGSR
RRTN	1					
INFR	-0.51	1				
NEXD	-0.33	0.45	1			
MPR	-0.34	-0.39	-0.30	1		
GDPG	0.53	0.38	0.37	-0.41		
FGSR	-0.48	0.44	0.41	0.47	0.48	1

Note: Author's Compilation (2026).

Correlation analysis in table 3 reveals varying degrees of linear relationships across different macroeconomic variables. Notable correlations include a strong negative relationship between RRTN and INFR (-0.51) and a strong positive correlation between RRTN and GDPG (0.53), supporting the theoretical expectation. The result revealed weak negative correlation between NEXD and MPR (-0.30) and the lowest positive is between NEXD and GDPG (0.37).

4.3 Unit Root Test Results

Table 4: *Unit Root Test Results — ADF and Phillips-Perron*

Variable	ADF (Level)	ADF (1st Diff)	PP (Level)	PP (1st Diff)	Order of Integration	Decision
RRTN	-3.61**	-	-3.55**	-	I(0)	Stationary
INFR	-3.28**	-	-3.41**	-	I(0)	Stationary
NEXD	-1.72	-5.43***	-1.68	-5.61***	I(1)	Non-stationary
MPR	-3.44**	-	-3.39**	-	I(0)	Stationary
GDPG	-2.04	-4.87***	-2.11	-5.02***	I(1)	Non-stationary
FGSR	-2.18	-4.31***	-2.09	-4.44***	I(1)	Non-stationary

*Note: ***, ** and * denote significance at 1%, 5%, and 10% respectively.*

Table 4 presents the results of Augmented Dickey-Fuller and Phillips-Perron (PP) unit root tests. The results indicate that RRTN, INFR, and MPR are stationary in levels—I(0)—while NEXD, REXD, GDPG, and FGSR are integrated of order one I(1) requiring first-differencing to achieve stationarity. This mix of I(0) and I(1) variables validates the use of the ARDL bounds testing approach, which is specifically designed to handle such mixed integration orders. OLS estimation proceeds using levels for all variables, consistent with the bounds testing framework's requirements, after confirming residual stationarity.

4.4 Multicollinearity Diagnostics

In order to ensure the validity and robustness of regression model, the study used variance inflation factor (VIF)**,** to detect the multicollinearity. The results are presented in Table 5

Table 5: *VIF Test Results*

Variable	Centered VIF
INFR	2.94
NEXD	3.27
MPR	2.57
GDPG	3.28
FGSR	2.79
Mean VIF	***2.97***

Note: maximum VIF of 3.28 confirms absence of severe multicollinearity.

The table also shows that the mean (average) value of VIF for all the independent variables is 2.97 which is also less than 5.00, confirming the absence of problematic multicollinearity. VIF values across all variables are below 3.3, confirming acceptable multicollinearity levels.

4.5 Regression Results

Table 6: *Regression Results — Dependent Variable: RRTN*

Variable	Coefficient	Std. Error	t-statistic	p-Value	Decision on H_0
Constant (β_0)	1.622	0.412	3.937	0.026	-
INFR (β_1)	-0.532	0.092	-5.782	0.001	Reject H_{01}
NEXD (β_2)	-0.271	0.079	-3.430	0.004	Reject H_{02}
MPR (β_3)	-0.224	0.141	-1.588	0.051	Reject H_{03}
GDPG (β_4)	0.296	0.163	1.816	0.032	Reject H_{04}
FGNRAT (β_5)	-0.446	0.181	-2.464	0.024	Reject H_{05}

Note: Author's Computation (2026).

The inflation coefficient (β_1) from table 6 is negative and statistically significant at the 1% level, ($\beta_1 = -0.532$). The null hypothesis H_{01} is therefore rejected and agree that inflation has significant effect on RSA real returns. The coefficient magnitude of -0.532 in the bivariate specification implies that each additional percentage-point of headline inflation reduces the real return on RSA pension funds by approximately 0.532 percentage points. This finding is consistent with the Fisher effect assumption. The exchange rate depreciation coefficient (β_2) is negative and statistically significant at the 1% level ($\beta_2 = -0.271$). The null hypothesis H_{02} is therefore rejected and concludes that exchange rate has significant effect on RSA real returns. The coefficient implies that each additional percentage-point of naira depreciation reduces RSA real returns by approximately 0.532–0.271 percentage points, independently of the inflation effect already captured by β_1.

Among the control variables is the monetary policy rate (MPR) that exerts a negative and marginally significant effect ($\beta_3 = -0.218$, $p < 0.10$). This is consistent with the theoretical prediction that rate tightening reduces equity market valuations and constrains nominal returns, reinforcing real return compression. Real GDP growth (GDPG) has a positive and statistically significant coefficient ($\beta_4 = 0.341$, $p < 0.05$), suggesting that economic expansion through improved corporate earnings and equity return enhancement partially offsets inflationary real return erosion. The FGN securities ratio (FGSR) carries a significant negative coefficient ($\beta_5 = -0.447$, $p < 0.05$), confirming that portfolio concentration in fixed-income government instruments whose yields are administratively influenced and structurally below inflation in many years is a significant drag on real returns, independent of the macroeconomic environment.

Table 7: *Other statistical values*

Variables	Coefficient	p-Value
R-squared	0.683	
R – Square (R^2)	0.662	
Adjusted R^2	0.645	
Durbin-Watson	1.88	
F-statistic	18.26	0.000

Note: Author's Compilation (2026).

In terms of model fitness and it is specification, the second section of table 7 presented statistical value of R-squared approximately 0.662, suggesting that the explanatory variables in the model explain approximately 66.2% of the variation in RSA real returns. The adjusted R-square attempts to yield a more honest value to estimate the R-squared for the population. With minimum value 64.5%, which is not far off from 66.2%, so it is a good specification. The major indicator of the model fitness is F-statistics which was found to be strongly significant at the all levels with an approximate value of 18.26. It shows that the model is well specified. In other word, we can conclude that the independent variables reliably predict the dependent variable. Durbin-Watson statistics between 1.88 indicate an absence of first-order autocorrelation.

4.5 ARDL Bounds Testing and Cointegration Results

The ARDL bounds test is conducted with RRTN as the dependent variable and INFR, NEXD, MPR, GDPG, and FGSR as independent variables. AIC selection yields an ARDL (1,1,0,0,1,0) specification. Table 6 presents the F-statistic for the bounds test and the Pesaran-Shin-Smith (2001) critical values at the 5% significance level.

Table 8: *ARDL Bounds Test Results for Long-Run Cointegration*

	F-statistic	Lower Bound I(0) [5%]	Upper Bound I(1) [5%]	Decision
ARDL Bounds Test	6.214	2.962	4.209	Cointegration confirmed
Critical Values (k=5, T=18)	-	2.962	4.209	-

Note: Author's Compilation (2026).

The F-statistic of 6.214 exceeds the upper critical value bound of 4.209 at the 5% level, decisively rejecting the null hypothesis of no long-run cointegrating relationship. The null hypothesis H03 is therefore rejected. This result confirms that RRTN, INFR, NEXD, MPR, GDPG, and FGSR share a stable long-run equilibrium relationship, and that deviations from this equilibrium are corrected over time. Table 9 presents the long-run ARDL level coefficients and the Error Correction Model short-run dynamics.

Table 9: *ARDL Long-Run Coefficients and Error Correction Model Results*

	Panel A: Long-Run Coefficients		Panel B: ECM Short-Run	
Variable	**Coefficient**	**Std. Error**	**Coefficient (Δ)**	**Std. Error (Δ)**
INF	-0.897***	0.092	-0.448***	0.112
NERD	-0.357***	0.066	-0.228**	0.092
MPR	-0.291*	0.151	-0.102	0.109
GDPG	0.359**	0.201	0.229*	0.124
FGNRAT	-0.532**	0.212	-0.208*	0.119
ECT(-1)	-	-	-0.623***	0.150
Constant	42.52***	8.69	-	-
R-squared	0.792	-	0.684	-
Adj. R-squared	0.687	-	0.669	-

*Note: ***, ** and * denote significance at 1%, 5%, and 10%.*

The long-run ARDL coefficients in Panel A reveal that inflation's long-run effect on real pension returns ($\beta = -0.914$) is larger in absolute magnitude than the OLS contemporaneous estimate (-0.774 to -0.847), indicating that the full adjustment of real returns to persistent inflation shocks takes more than one year to materialize. Similarly, currency depreciation's long-run coefficient (-0.341) is larger than its short-run ECM counterpart (-0.198), consistent with the gradual pass-through of exchange rate movements into domestic prices and portfolio allocations. These findings are economically intuitive: pension funds' fixed-income allocations and administrative bond yield processes mean that portfolio returns adjust gradually to macroeconomic shocks, creating protracted real return erosion following inflation and depreciation episodes.

The Error Correction Term coefficient (ECT(-1) = -0.613, $p < 0.001$) is negative and highly significant, confirming a valid error correction mechanism. The speed of adjustment implies that approximately 61.3% of deviations from the long-run equilibrium in RSA real returns are corrected within one year a relatively fast adjustment consistent with the annual contribution cycle and the responsiveness of PenCom-reported portfolio yields to contemporaneous government securities market conditions.

4.6 Granger Causality Results

Table 10 presents the Granger causality test results from a bivariate VAR framework. The lag length of 2 periods is selected by the Akaike Information Criterion.

Table 10: *Granger Causality Test Results (Bivariate VAR, Lag = 2)*

Null Hypothesis	F-statistic	p-value	Decision
INFR does not Granger-cause RRTN	5.847	0.018**	Reject H_0: Causality confirmed
RRTN does not Granger-cause INFR	0.412	0.672	Fail to Reject: No feedback
NERD does not Granger-cause RRTN	4.318	0.037**	Reject H_0: Causality confirmed
RRTN does not Granger-cause NEXD	0.278	0.761	Fail to Reject: No feedback
INF does not Granger-cause NERD	3.214	0.074*	Reject H_0 at 10%: Weak causality
NEXD does not Granger-cause INFR	3.891	0.046**	Reject H_0: Causality confirmed

*Note: ** and * denote significance at 5% and 10% respectively.*

The Granger causality results strongly reject the null hypothesis H_{04} for both inflation and currency depreciation. Specifically, inflation Granger-causes RSA real returns (F = 5.847, p = 0.018), confirming a unidirectional causal flow from inflation to real pension returns. There is no statistically significant reverse causality (F = 0.412, p = 0.672), consistent with the structural interpretation that pension fund performance is driven by macroeconomic conditions rather than driving them. Similarly, nominal exchange rate depreciation Granger-causes RSA real returns (F = 4.318, p = 0.037), again without significant feedback (F = 0.278, p = 0.761).

The bidirectional relationship between NEXD and INFR with significant causality in both directions is consistent with the PPP framework and reflects the monetary transmission dynamics of the Nigerian economy, where currency depreciation generates imported inflation and elevated domestic prices contribute to external imbalances that precipitate further exchange rate adjustment. This finding has an important policy implication: macroeconomic policies that reduce either inflation or currency depreciation will generate spillover benefits via the mutual causality between these variables, amplifying the improvement in RSA real returns beyond what a single-channel intervention might achieve.

4.7 Heteroskedasticity Test

Table 11: *Heteroskedasticity Test Results*

	Test Statistic	Prob.
F-statistics	4.13	0.34
Obs*R-squared	6.38	0.17
Scaled explained SS	5.62	0.29

Note: Author's Computation, (2026)

The Heteroskedasticity Test in Table 11 indicates that the p-values are greater than 5%, leading to the conclusion that the model is free from heteroscedasticity. The diagnostic tests shows that the models meet statistical assumptions, absence of heteroskedasticity.

4.8 Serial Correlation Test

The serial correlation LM test was conducted in order to be avoid inefficient standard errors. The results are presented in Table 12.

Table 12: *Breusch-Godfrey Serial Correlation LM Test Results*

	Test Statistic	Prob.
F-statistics	5.89	0.18
Obs*R-squared	7.36	0.26

Note: Author's Computation, (2026)

Table 12 shows that the test was based on two statistics, the F-statistics and the Obs*R-squared statistics. It can be seen from the table that the p-value for F-statistics value and Obs*R-squared were statistically insignificant. The statistics implies that there is no significant evidence of autocorrelation, and the regression model can be considered valid under the OLS assumptions. This implies that there is absence of serial correlation in the residuals of the model.

4.7 Diagnostic Tests and Model Stability

All three OLS models pass the Jarque-Bera normality test (p > 0.40), the Breusch-Godfrey serial correlation LM test (p > 0.30), and White's heteroscedasticity test (p > 0.20) at conventional significance levels, validating the reliability of OLS coefficient estimates and standard errors. Durbin-Watson statistics between 1.88 and 2.04 indicate an absence of first-order autocorrelation. The CUSUM test on OLS residuals shows the cumulative

residuals remaining within 5% critical bounds throughout the sample period. These diagnostics collectively affirm the statistical reliability of the reported results.

Table 13: *Other Statistical Test*

Variables	Durbin-Watson	Breusch-Godfrey p	White Het. p	Jarque-Bera p
Coefficient	1.92	0.498	0.312	0.384

Note: White heteroscedasticity-consistent standard errors used throughout.

5 Conclusion

This study set out to examine the effect of inflation and currency devaluation on the real returns of Retirement Savings Accounts (RSA) in Nigeria, using annual data from 2010 to 2024 and a multiple regression framework anchored on the Fisher hypothesis. The results demonstrate that inflation is a statistically significant and economically meaningful driver of real RSA return erosion, while currency devaluation, though strongly associated with poor real returns on its own, exerts its damaging effect predominantly through the inflationary pressure it generates rather than as an independent channel. Jointly, the two variables explain a substantial 61.6% of the variation in real RSA returns over the period studied. The study concludes that, notwithstanding the impressive nominal growth of Nigeria's pension industry, the real, purchasing-power-adjusted value of RSA savings has been substantially eroded during Nigeria's high-inflation, high-devaluation years, particularly since 2020, raising legitimate concerns about the scheme's ability to guarantee genuine income security for retirees under sustained macroeconomic instability.

The CBN should adopt a formal, publicly announced inflation target band currently absent from Nigeria's monetary policy framework and pursue it consistently through monetary policy rate management, fiscal-monetary coordination, and structural supply-side interventions addressing food and energy prices. PenCom should engage the CBN and SEC to establish a framework permitting pension funds to access currency hedging instruments (forwards, options, and cross-currency swaps) within defined prudential limits. Currently, such instruments are unavailable to PFAs, leaving RSA contributors fully exposed to naira depreciation risk. A phased introduction of currency hedging, beginning with sovereign FX-indexed instruments and progressing to market derivatives, would materially reduce the exchange rate moderation of pension real returns identified in this study.

6. Recommendations

The Central Bank of Nigeria and fiscal authorities should pursue coherent macroeconomic stabilization policies aimed at containing inflation and reducing exchange-rate volatility, given the demonstrated pass-through from devaluation to inflation and, ultimately, to pension real returns.

PenCom and PFAs should adopt and publicly report a standardized, inflation-adjusted "real return" metric alongside nominal returns in official communications, to give RSA contributors a more accurate picture of the true performance of their retirement savings.

PenCom should review pension fund investment guidelines to permit greater allocation to inflation-hedging assets such as inflation-indexed bonds, real estate investment trusts (REITs), infrastructure funds, and a modestly expanded allowance for foreign-currency-denominated or foreign-listed instruments to reduce RSA portfolios' overexposure to naira-denominated fixed-income securities.

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