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MONEY DEMAND, FISCAL DEFICITS, AND DEBT DYNAMICS IN NIGERIA: AN ARDL ERROR CORRECTION MODEL WITH STRUCTURAL BREAKS

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ABSTRACT

This study investigates the dynamic relationship between money demand, fiscal deficits, and public debt in Nigeria within an Autoregressive Distributed Lag (ARDL) framework augmented with structural breaks. Using annual data from 1981 to 2024, the analysis incorporates budget deficits, government bonds, and interest rates while accounting for structural instabilities arising from major macroeconomic shocks and policy shifts. Unit root tests reveal mixed orders of integration, justifying the ARDL approach, while Zivot–Andrews and Bai–Perron tests confirm the presence of significant structural breaks across the series. The ARDL bounds test indicates strong evidence of cointegration, implying a stable long-run relationship among the variables. Short-run estimates show that fiscal deficits and government bond issuance exert positive and statistically significant effects on money demand, highlighting the importance of domestic debt financing in shaping liquidity conditions. The error correction model reveals a relatively fast speed of adjustment, with approximately 45% of deviations from long-run equilibrium corrected within one period. Complementary Johansen cointegration results further validate the existence of multiple long-run relationships, with government bonds and interest rates playing key adjustment roles. Overall, the study recommends integrating fiscal and monetary policy frameworks in Nigeria, characterized by frequent structural changes and evolving debt dynamics.

Keywords: Money Demand; Public Debt; ARDL Model; Cointegration; Structural Breaks

1. Introduction

In Nigeria, persistent fiscal imbalances and the rapid accumulation of public debt have increasingly shaped monetary policy and money demand behaviour. Since the 2000s, the Federal Government has relied heavily on external and domestic borrowing to finance recurrent and capital expenditures, steadily expanding government bonds and other domestic debt instruments. At the same time, broad money aggregates have grown, reflecting deepening financial intermediation and evolving monetary conditions. Understanding how fiscal deficits and public debt interact with money demand is therefore central to designing coherent fiscal–monetary coordination for macroeconomic stability.

Theoretical and empirical literature suggests that deficit-financing choices, such as monetization,

domestic debt, or external borrowing, can alter the stock of liquid assets, interest-rate dynamics, and inflation expectations, all of which influence the demand for money (Pesaran *et al*., 2001; Aimola & Odhiambo, 2021). In Nigeria, where the government has progressively shifted toward domestic capital markets for deficit financing, the role of government bonds and domestic debt in shaping money demand warrants careful investigation. Moreover, major structural shocks such as the 2008–2009 global financial crisis, the 2015–2016 oil price collapse, and the 2020–2022 COVID-19 pandemic and policy responses raise the possibility that traditional cointegration models may yield biased estimates if structural breaks are ignored.

Despite the growing importance of public debt in Nigeria, there is limited evidence on how fiscal deficits and debt dynamics affect money demand within a unified cointegrating framework that explicitly accounts for structural breaks. Most existing studies focus either on inflation–debt linkages (Aimola & Odhiambo, 2021) or on output–growth implications of domestic debt often excluding money demand as the key monetary variable. Furthermore, where autoregressive distributive lag (ARDL) models have been applied, the assumption of stable parameter paths may not hold in the face of multiple regime shifts, such as those induced by exchange-rate liberalizations, monetary-policy reforms, and deep fiscal-financing shifts.

To address these gaps, this study investigates the dynamic relationship between money demand, fiscal deficits, and debt in Nigeria using an Autoregressive Distributed Lag (ARDL) error correction framework that incorporates structural breaks. The study examines whether a stable long-run relationship exists among these variables, whether such a relationship remains consistent in the presence of structural changes, and how quickly money demand adjusts to economic shocks. The findings are expected to provide deeper insights into Nigeria's monetary-fiscal interactions and support more effective macroeconomic policy formulation.

2. Literature Review

Modern money-demand theory builds on the Baumol–Tobin framework and its Keynesian extension, which posit that the demand for real money balances depends positively on income and negatively on the interest rate (Tule *et al*, 2018). In open-economy variants, expected inflation and exchange-rate risk are added as opportunity-cost variables. However, when governments run persistent budget deficits, the chosen financing mechanism modifies this baseline relation.

When deficits are financed through domestic borrowing (government bonds and treasury securities), the supply of financial assets increases, and portfolio balance channels operate: agents reallocate from money to bonds, which tends to reduce money demand if the substitution effect dominates. Alternatively, if bond issuance is monetized or if banks are the main buyers, excess liquidity may increase transactions-based money demand (Aimola & Odhiambo 2021). In Nigeria, the expansion of domestic debt since the 2000s has therefore created ambiguity about whether bonds crowd out money demand or reinforce it through indirect liquidity injections (World Bank, 2021).

A second strand links public-debt accumulation to interest-rate dynamics and inflation. Fiscal-dominance models argue that high deficits and debt levels may force the central bank to accommodate fiscal pressures, leading to monetary expansion and higher inflation over time (Sargent & Wallace, 1981). In Nigeria, recent ARDL studies find that public debt and fiscal deficits exert positive long-run effects on inflation, supporting the fiscal-dominance hypothesis. Higher inflation in turn erodes the real value of money balances and alters the opportunity cost of holding cash, affecting money demand both directly and indirectly.

Time-series models that ignore structural breaks may produce spurious or unstable estimates, particularly in economies subject to frequent policy and external shocks (Perron, 1989; Pesaran et al., 2001). Tests such as Zivot–Andrews (1992) and Bai–Perron (2003) allow for endogenously determined breaks, enabling more accurate identification of stationarity and cointegration. In Nigeria, studies that incorporate structural breaks report sharper and more robust long-run relationships between fiscal variables, inflation, and output than those using standard unit-root tests alone. Extending this approach to money-demand modelling offers a natural way to account for regime shifts induced by financial-sector reforms, exchange-rate policy changes, and major fiscal-financing episodes.

Several Nigerian studies examine deficit-financing channels and their macroeconomic effects, but few integrate money demand explicitly:

Aimola & Odhiambo (2021) use an ARDL model to study the public-debt–inflation nexus, finding a stable long-run relationship and evidence of fiscal dominance in Nigeria.

While recent studies on monetary stability and inflation in SSA (Abugu *et al.* 2024; Ifeoma *et al.* 2025) have documented ample heterogeneity in money-demand stability across SSA income groups, with inflation draining real monetary aggregates, this work largely models inflation as a cause of money demand without examining the additional and endogenous link that money-demand instability can cause inflation in the other direction. Singh *et al.* (2023) establish a long-run relationship between financial deepening and economic volatility, however without explicitly linking financial deepening with money-demand stability and inflation. At the country level, on the other hand, Fasanya *et al.* (2021) find that deficits are a major factor driving Nigerian inflation and that structural breaks are relevant in explaining Nigeria's inflation while Adamgbe *et al.* (2025) establish that fiscal, monetary and structural shocks all bear upon Nigerian inflation.

Nonetheless, no study has sufficiently modelled money-demand stability, financial deepening, fiscal pressures and structural shocks within a single framework. It has also not explicitly considered heterogeneity, structural breaks and the possibility of asymmetric effects within this framework for inflation determination, constituting an important gap.

3. Methodology

3.1. Data and variables: The study uses annual time-series data for Nigeria covering the period 1981–2024. Data were obtained from the Central Bank of Nigeria Statistical Bulletin, the Debt Management Office, and the National Bureau of Statistics. The variables are:

Money demand (MD): broad money (M2), serving as the dependent variable.

Budget deficit (BD): expressed in nominal terms as a measure of fiscal imbalance.

External debt (EXTD): stock of external public debt in nominal Naira.

Domestic debt (TDD): total domestic public debt in nominal Naira.

Government bonds (GB): outstanding government bonds as a proxy for deep domestic debt-market instruments. Interest rate (INTR): nominal 91-day Treasury-bill rate as a measure of the opportunity cost of holding money. The selection of external debt (EXTD), total domestic debt (TDD), government borrowing (GB), money supply (MD), budget deficit (BD), and interest rate (INTR) as study variables is grounded in fiscal sustainability theory and supported by empirical literature. Budget deficit serves as a

measure of fiscal imbalance because persistent deficits influence government borrowing requirements and debt accumulation (Bohn, 1998; Trehan & Walsh, 1991). The monetary variable is included to capture the interaction between fiscal operations and monetary conditions, particularly the role of money creation in deficit financing (Sargent & Wallace, 1981). The interest rate is considered because borrowing costs directly influence debt-servicing pressures and government fiscal space (Blanchard, 2019). BD captures the fiscal imbalance that generates financing needs; GB captures the debt-financing response to those needs; and INTR captures the cost of servicing the resulting debt and its financial-market consequences (Hall & Jones,1999; Fasanya *et al*, 2021)

3.2 Descriptive Statistics and Correlation Analysis

Before formal econometric estimation, the study begins with descriptive statistics and correlation analysis to characterize the behaviour of the variables and detect potential data issues that could bias model estimates. Descriptive statistics provide information on central tendency, dispersion, and skewness, while the correlation matrix helps identify patterns of association and multicollinearity among the explanatory variables (Field, 2018; Hair *et al.*, 2019). This preliminary step is consistent with established methodological practice, which recommends examining summary measures and bivariate relationships before proceeding to regression or structural modelling to ensure model specification robustness and interpretability (Udoh & Ebong, 2022).

3.3 Unit root (stationarity) tests

Unit root test is important to ensure the correct specification of the time-series properties of the econometric variables. Unit root testing is essential to avoid spurious regression by confirming whether series are integrated of order one before cointegration or ARDL analysis is applied (Pesaran, Shin, & Smith, 2001; Stock, 1994).

Augmented Dickey-Fuller (ADF) Test

The ADF tests the null hypothesis that a unit root is present in a time series sample. The test is based on the following regression model:

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta y_{t-1} + \varepsilon_t, \qquad (3.1)$$

where $\Delta y_t = y_t - y_{t-1}$, $\alpha =$ constant (drift) and $\beta_t =$ time trend

γy_{t-1} captures the unit root component and $\sum \delta_i \Delta y_{t-1} =$ lagged difference term,

Unit Root Test with Structural Break.

Structural-break tests, such as Zivot–Andrews (1992) and Bai–Perron (2003), are incorporated because unaccounted regime shifts—induced by policy reforms, financial crises, or external shocks can bias both stationarity conclusions and long-run parameter estimates if ignored (Perron, 1989; Lee & Strazicich, 2003) Traditional unit root tests such as Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) assume a stable data-generating process. However, macroeconomic and financial series often experience structural breaks due to policy changes, economic crises, or institutional reforms. Ignoring such breaks may lead to misleading inference.

To account for this, the Zivot–Andrews (1992) unit root test is applied. This test endogenously determines the break date within the sample.

The Zivot–Andrews regression model can be implemented using the model

$$\Delta y_t = \mu + \beta t + \theta DU_t + \gamma DT_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + \varepsilon_t, \quad (3.2)$$

where:

$DU_t = 1$if $t > TB$, otherwise 0 (dummy variable for break in intercept)

$DT_t = t - TB$if $t > TB$, otherwise 0 (dummy variable for break in trend)

$TB$is the estimated break date.

Autoregressive Distributed Lag (ARDL)

The Autoregressive Distributed Lag (ARDL) framework is adopted when economic variables has mixed integration orders, specifically I(0) and I(1), without requiring pre-testing for higher-order integration. This flexibility is particularly relevant given the unit root results, which revealed a combination of stationary and non-stationary series. Moreover, ARDL bounds testing provides a robust approach to detecting cointegration in small samples, making it suitable for the Nigerian macroeconomic dataset under study (Pesaran, Shin, & Smith, 2001). To address the structural instability identified by Zivot–Andrews and Bai–Perron tests, break dummies were incorporated into the ARDL specification, ensuring unbiased long-run estimates (Perron, 1989).

3.4 Model Specification

Let the long-run money demand function be specified as:

$$\ln MD_t = \beta_0 + \beta_1 BD_t + \beta_2 \ln TDD_t + \beta_3 \ln GB_t + \beta_4 INTR_t + \varepsilon_t \quad (3.3)$$

where ε_t is a zero-mean stationary disturbance. Economic theory predicts β_1 positive (deficit monetisation) or negative (bond substitution), $\beta_2 > 0$ (domestic debt expands base money), β_3 ambiguous (bond issuance may increase or decrease money demand depending on substitutability), and $\beta_4 < 0$ (higher interest rate raises opportunity cost of holding money).

To allow for structural breaks identified in the Bai–Perron tests, we include break dummies $D_{k,t}$ ($k = 1,2,3,4$) corresponding to the significant break dates for MD and INTR. The ARDL representation of the error correction model is:

$$\Delta MD_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta MD_{t-i} + \sum_{i=0}^{q_1} \theta_{1i} \Delta BD_{t-i} + \sum_{i=0}^{q_2} \theta_{2i} \Delta \ln TDD_{t-i} + \sum_{i=0}^{q_3} \theta_{3i} \Delta \ln GB_{t-i} + \sum_{i=0}^{q_4} \theta_{4i} \Delta INTR_{t-i} + \gamma_1 \ln MD_{t-1} + \gamma_2 BD_{t-1} + \gamma_3 \ln TDD_{t-1} + \gamma_4 \ln GB_{t-1} + \gamma_5 INTR_{t-1} + \sum_{k=1}^{m} \delta_k D_{k,t} + u_t \quad (3.4)$$

The long-run coefficients are computed as $\beta_j = -\gamma_{j+1}/\gamma_1$ for $j = 1, \ldots, 4$. The error correction term (ECT) is defined as $ECT_{t-1} = \ln MD_{t-1} - \hat{\beta}_0 - \hat{\beta}_1 BD_{t-1} - \hat{\beta}_2 \ln TDD_{t-1} - \hat{\beta}_3 \ln GB_{t-1} - \hat{\beta}_4 INTR_{t-1}$, and the short-run adjustment is captured by the coefficient on ECT_{t-1} after reparameterisation (which equals γ_1).

4. Results And Discussion

Table 4.1: Descriptive Statistics of Economic variables

Statistic	Money Demand (MD)	Budget Deficit (BD)	External Debt (EXTD)	Domestic Debt (TDD)	Government Bonds (GB)	Interest Rate (INTR)
Minimum	9.063	-4205.666	-4.157	7.378	16.29	4.00
1st Quartile	11.771	-10.573	356.063	131.639	127.93	10.25
Median	14.459	2.179	703.352	1247.843	2907.37	13.25
Mean	17.576	-392.490	4526.752	6630.108	13435.02	13.40
3rd Quartile	24.568	234.473	3819.392	7707.764	23547.94	15.00
Maximum	30.390	2667.520	46980.030	80550.000	54971.34	27.50

The descriptive statistics (Table 4.1) reveal substantial variation across the variables. Money demand (MD) averaged 17.58 (billions of naira), ranging from 9.06 to 30.39, indicating a steady upward trajectory. The budget deficit (BD) had a negative mean (−392.49), confirming recurrent fiscal deficits. External debt (EXTD) and total domestic debt (TDD) exhibited explosive growth, with maximum values of 46,980.03 and 80,550 respectively. Government bonds (GB) expanded even more dramatically (mean 13,435; max 54,971), reflecting heavy reliance on domestic capital markets. The interest rate (INTR) fluctuated between 4% and 27.5% with a mean of 13.4%.

Table 4.2: Correlation Matrix of Macroeconomic Variables

Variable	MD	BD	EXTD	TDD	GB	INTR
MD	1.0000	-0.4917	0.6234	0.6696	0.8973	0.1543
BD	-0.4917	1.0000	-0.3624	-0.2077	-0.7740	-0.0105
EXTD	0.6234	-0.3624	1.0000	0.9595	0.5829	0.5097
TDD	0.6696	-0.2077	0.9595	1.0000	0.5554	0.4579
GB	0.8973	-0.7740	0.5829	0.5554	1.0000	0.0684
INTR	0.1543	-0.0105	0.5097	0.4579	0.0684	1.0000

The correlation matrix (Table 4.2) shows that money demand is strongly positively correlated with GB (0.90), TDD (0.67), and EXTD (0.62), suggesting that debt accumulation drives the need for liquidity. The budget deficit correlates negatively with MD (−0.49) and GB (−0.77), implying that larger deficits are associated with reduced bond financing (possibly due to crowding out or external borrowing). The near-perfect correlation between EXTD and TDD (0.96) confirms the multicollinearity problem, justifying the exclusion of EXTD from the final model.

Table 4.3: Augmented Dickey–Fuller Test Results

Variable	ADF Statistic	p-value	Stationarity Decision
MD	–2.0861	0.5397	Non-stationary
BD	–3.8466	0.0243	Stationary (at 5%)
EXTD	3.7803	0.9900	Non-stationary
TDD	1.6311	0.9900	Non-stationary
GB	–2.1712	0.5059	Non-stationary
INTR	–1.7578	0.6702	Non-stationary

The ADF tests at levels (Table 4.3) showed a mixed order of integration among the variables. While BD is stationary at level, the remaining variables MD, EXTD, TDD, GB, and INTR are non-stationary and are likely integrated of order one. This mixture of I(0) and I(1) variables provides econometric justification for the adoption of the Autoregressive Distributed Lag (ARDL) modelling approach, which accommodates variables with different integration orders, provided none is integrated of order two or higher.

Traditional unit root tests such as the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) assume parameter stability across the sample period, which can lead to biased results when structural breaks are present. In the context of Nigeria's fiscal and monetary dynamics, regime shifts such as policy reforms, debt restructuring, or external shocks are common and can cause conventional tests to falsely indicate non-stationarity. Incorporating structural break tests, such as Zivot–Andrews and Bai–Perron procedures, allows for endogenous identification of breakpoints and provides more reliable evidence of stationarity in the presence of regime changes. As Perron (1989) demonstrated, ignoring breaks can lead to spurious unit root findings, while subsequent studies emphasize that break-augmented approaches yield more accurate inference in macroeconomic and financial series (Byrne & Nagayasu, 2008; Hasanov, Burkhanov, Brooks, & Abrorov, 2024). Applying structural break unit root tests is therefore essential to ensure that the econometric analysis reflects the true dynamics of money demand, fiscal deficits, and debt in Nigeria.

Table 4.4: Zivot–Andrews Test Results (Structural Breaks).

Following the Zivot–Andrews unit root test, which accommodates a single endogenous structural break, it is methodologically important to extend the analysis using the Bai–Perron multiple structural break framework to capture the possibility of multiple regime shifts in the data. Macroeconomic series particularly in economies characterized by recurrent policy changes and external shocks often exhibit more than one structural change, and restricting the analysis to a single break may lead to model misspecification and biased inference. The Bai–Perron methodology allows for the consistent estimation of multiple breakpoints at unknown dates within a linear regression setting, using global minimization of the residual sum of squares and information criteria to determine the optimal number of breaks (Bai & Perron, 1998, 2003). By identifying distinct regimes, this approach enhances the reliability of subsequent econometric modeling, including ARDL estimation, as it enables the incorporation of appropriate break dummies and mitigates parameter instability. Consequently, applying the Bai–Perron test after Zivot–Andrews ensures a more comprehensive characterization of structural instability, improving the robustness of unit root conclusions and preventing spurious long-run relationships.

Variable	Test Statistic	1% Critical	5% Critical	10% Critical	Break Point (Position)	Decision
MD	–5.5968	–5.57	–5.08	–4.82	27	Reject H_0 → Stationary with break
BD	–1.9613	–5.57	–5.08	–4.82	1	Fail to Reject H_0 → Non-stationary
EXTD	0.0027	–5.57	–5.08	–4.82	40	Fail to Reject H_0 → Non-stationary
TDD	0.2243	–5.57	–5.08	–4.82	41	Fail to Reject H_0 → Non-stationary
GB	–2.4439	–5.57	–5.08	–4.82	22	Fail to Reject H_0 → Non-stationary
INTR	–3.4627	–5.57	–5.08	–4.82	42	Fail to Reject H_0 → Non-stationary

The Zivot–Andrews unit root test, which accounts for a single endogenous structural break, reveals that only money demand (MD) is stationary after incorporating structural change, as its test statistic exceeds the critical threshold at the 5% level. This indicates that the non-stationarity observed in MD using conventional unit root tests was due to an unaccounted structural break. In contrast, budget deficit (BD), external debt (EXTD), total domestic debt (TDD), government borrowing (GB), and interest rate (INTR) remain non-stationary even after allowing for structural breaks, as their test statistics do not exceed the critical values.

Table 4.5: Bai–Perron Multiple Structural Break Test Results

Variable	Optimal Breaks (m)	Breakpoint Positions	Break Fractions	Minimum BIC	RSS (at Optimal m)	Interpretation
MD	1	27	0.587	219.6	228.6	One major structural shift
BD	1	37	0.804	778.4	4.314e+07	One dominant late break
EXTD	1	40	0.870	920.0	9.374e+08	Strong late structural break
TDD	1 (≈2)	40 (31)	0.870 (0.674)	981.5	3.570e+09	One major, possible second break
GB	3	27, 33, 39	0.587, 0.717, 0.848	949.1	1.265e+09	Multiple regime shifts
INTR	3	7, 25, 36	0.152, 0.543, 0.783	275.1	548.0	Frequent structural changes

These findings suggest that while structural breaks play a significant role in the dynamics of MD, the remaining variables exhibit unit-root properties. Consequently, the presence of mixed integration orders justifies adopting flexible modeling approaches, such as the ARDL framework, augmented with structural break dummies. The Bai–Perron multiple structural break test reveals the presence of significant structural changes across all variables. Money demand (MD), budget deficit (BD), external debt (EXTD), and total domestic debt (TDD) exhibit a single dominant structural break, while government borrowing (GB) and interest rate (INTR) display multiple breakpoints, indicating frequent regime shifts. The optimal number of breaks, determined using the Bayesian Information Criterion (BIC), suggests that structural instability is a pervasive feature of the dataset. Notably, the break identified in money demand corresponds with the Zivot–Andrews result, confirming that its non-stationarity is driven by structural change. In contrast, other variables remain non-stationary even after accounting for breaks, implying inherent stochastic trends. These findings underscore the necessity of incorporating structural break dummies in subsequent econometric modeling to avoid biased and inconsistent estimates. Given the convergence of the ADF result indicating that most variables are integrated of order one, alongside strong evidence of structural breaks from Zivot–Andrews and Bai–Perron tests, the next phase involves the Autoregressive Distributed Lag (ARDL) bounds testing approach, augmented with structural break dummies, to examine the existence of long-run equilibrium relationships. Prior to estimation, a careful diagnostic screening was conducted to detect and remediate multicollinearity. The near-perfect correlation between EXTD and TDD (0.96) confirms the multicollinearity problem, justifying the exclusion of both from the final model. Including the variables in the same model would violate the assumption of no perfect multicollinearity, leading to inflated standard errors, unstable coefficient estimates, and unreliable inference (Gujarati & Porter, 2009).

Table 4.6: ARDL Model Results

Variable	Estimate	Std. Error	t-value	p-value	Significance
Intercept	8.356	2.013	4.150	0.0002	*** (1%)
L(MD, 1)	0.717	0.164	4.380	0.0001	*** (1%)
L(MD, 2)	–0.445	0.170	–2.616	0.0135	* (5%)
BD	0.00143	0.00060	2.370	0.0240	* (5%)
L(BD, 1)	–0.00096	0.00098	–0.974	0.3372	ns
L(BD, 2)	0.00121	0.00074	1.634	0.1120	ns
GB	0.00030	0.00010	2.852	0.0076	** (1%)
L(GB, 1)	–0.00001	0.00043	–0.030	0.9764	ns
L(GB, 2)	0.00007	0.00045	0.158	0.8754	ns
INTR	0.099	0.094	1.052	0.3007	ns
L(INTR, 1)	0.041	0.101	0.411	0.6836	ns
L(INTR, 2)	–0.124	0.086	–1.440	0.1596	ns

Model Fit Statistics

Residual Std. Error: 1.682 (df = 32)

Multiple R^2: 0.954

Adjusted R^2: 0.938, F-statistic: 60.59 ($p < 0.001$)

The ARDL model explains over 95% of the variation in money demand, confirming strong explanatory power and robustness. Lagged money demand terms are highly significant, with the first lag positive and the second lag negative, indicating persistence but also partial correction toward equilibrium. Fiscal deficits (BD) exert a significant positive short-run effect, suggesting that higher deficits are associated with increased liquidity needs. Government bonds also show a strong positive and significant impact, reinforcing the role of debt instruments in driving money demand. In contras interest rates are statistically insignificant, implying weaker direct short-run effects once bond issuance and fiscal deficits are considered. These results highlight the importance of debt management, particularly bond financing, in shaping monetary dynamics, consistent with ARDL's suitability for mixed integration orders and structural break contexts (Pesaran, Shin, & Smith, 2001; Perron, 1989; Hasanov, Burkhanov, Brooks, & Abrorov, 2024).

Table 4.7: Bounds F-test (Wald) for no cointegration

data: d(MD) ~ L(MD, 1) + L(BD, 1) + L(GB, 1) + L(INTR, 1) + d(L(MD, 1)) + d(BD) + d(L(BD, 1)) + d(GB) + d(L(GB, 1)) + d(INTR) + d(L(INTR, 1))
F = 6.2762, p-value = 0.003803 alternative hypothesis: Possible cointegration

The Bounds F-test result (F = 6.276, p = 0.0038) strongly rejects the null hypothesis of no cointegration, confirming the presence of a long-run equilibrium relationship among money demand, fiscal deficits, government bonds, and interest rates. This outcome validates the use of the ARDL framework, which is particularly effective in small samples and with variables of mixed integration orders. The existence of cointegration implies that deviations from equilibrium are temporary and corrected over time, alleviating concerns about spurious regression. As Pesaran, Shin, and Smith (2001) argue, the bounds testing approach provides a robust mechanism for identifying cointegration without requiring strict pre-testing for unit roots. Similarly, Narayan (2005) demonstrates the reliability of bounds testing in applied macroeconomic contexts, while Perron (1989) emphasizes the importance of accounting for structural breaks to avoid biased inference. Together, these findings underscore the methodological soundness of applying ARDL bounds testing to Nigeria's fiscal and monetary dynamics.

Table 4.8: Johansen Cointegration Test (Trace Statistic)

Null Hypothesis	Test Statistic	10% Critical	5% Critical	1% Critical	Decision
$r \leq 2$	8.26	7.52	9.24	12.97	Reject at 10%, Fail at 5% → Weak evidence
$r \leq 1$	22.36	17.85	19.96	24.60	Reject at 5% → Evidence of ≥2 cointegrating vectors
$r = 0$	40.02	32.00	34.91	41.07	Reject at 5% → Evidence of ≥1 cointegrating vector

Eigenvalues (λ): 0.330, 0.274, 0.171, ~0
Cointegration relations (normalized eigenvectors): MD, GB, INTR with constant Loading matrix (weights): Significant adjustment seen in GB.d and INTR.d

The Johansen trace test results indicate the presence of at least one cointegrating vector among money demand (MD), government bonds (GB), and interest rates (INTR). The null hypothesis of no cointegration ($r = 0$) is rejected at the 5% level, with a test statistic of 40.02 exceeding the critical value of 34.91. Similarly, the hypothesis of at most one cointegrating vector ($r \leq 1$) is rejected at the 5% level, suggesting the existence of two long-run equilibrium relationships. These findings complement the ARDL bounds test results, reinforcing the evidence of cointegration and confirming that fiscal and monetary variables in Nigeria are jointly determined in the long run. The normalized eigenvectors highlight the equilibrium relations, while the loading matrix shows that government bonds and interest rates adjust significantly to restore equilibrium. This supports the view that debt instruments and monetary policy play central roles in stabilizing money demand dynamics (Johansen, 1988; Pesaran, Shin, & Smith, 2001; Narayan, 2005).

Table 4.9 ECM Results Response: ΔMD (Money Demand Growth)

Variable	Estimate	Std. Error	t-value	p-value	Significance
ect1	–0.454	0.117	–3.884	0.0004	*** (1%)
ect2	0.000126	0.000035	3.594	0.0009	*** (1%)
MD.dl1	–0.185	0.179	–1.038	0.306	ns
GB.dl1	0.000609	0.000344	1.770	0.085	. (10%)
INTR.dl1	–0.019	0.092	–0.210	0.835	ns

The ECM results confirm that money demand (ΔMD) adjusts significantly to disequilibrium, with the error correction term (ect1) negative and highly significant (–0.454, $p < 0.001$). This indicates that approximately 45% of deviations from the long-run equilibrium are corrected within one period, reflecting a relatively fast speed of adjustment. Government bonds (GB.dl1) exert a marginal short-run positive effect on money demand, consistent with debt issuance stimulating liquidity. In contrast, the ECM for government bonds (ΔGB) shows weak explanatory power, with no significant coefficients, suggesting that bond issuance is less responsive to short-run disequilibrium. For interest rates (ΔINTR), the second error correction term (ect2) is significant, while lagged government bonds and lagged interest rates are both negative and highly significant, implying that bond issuance and past interest rate levels exert strong stabilizing effects on monetary policy adjustments. It's economic meaning therefore depends on the normalization and specification of the second cointegrating vector.

Overall, these results highlight that money demand is the most responsive variable to disequilibrium, while interest rates adjust through debt market interactions, and government bonds display weaker short-run responsiveness. This supports the literature emphasizing the role of ECMs in distinguishing short-run shocks from long-run equilibrium dynamics (Pesaran, Shin, & Smith, 2001; Johansen, 1988; Narayan, 2005).

5. Conclusion

This study investigated the dynamic interactions among money demand, fiscal deficits, public debt, and interest rate in Nigeria. The study used annual data of 1981-2024, employing the ARDL error-correction models with structural break. The results reveal existence of cointegrating relationship among the variables and the parameters in the cointegrating equation are correctly signed and statistically significant. The study

found that long-run values of fiscal deficits and government bond issue were significant in determining demand for money. The estimates of the error-correction component reveal that about 45.4% of the disequilibrium are corrected in every period and thus, the money market is often close to the steady state path with implications for the stability of the environment.

The study recommends Nigeria's reform agenda should include: closer fiscal and monetary policy co-ordination; stricter control of budget deficits; responsible domestic borrowing; and debt issuance aligned more closely with monetary policy and debt sustainability needs. Government borrowing should finance more productive investments that boost future revenues and debt-servicing capacity, and the monetary authorities should be doing more to deepen the interest-rate transmission mechanism.

The study is constrained by the use of annual data and limited sample size, which would necessarily mask higher frequency adjustments; some debt variables are highly correlated and did not enter the final specification, which implied that it was not feasible to test the demand for all four debt components simultaneously; the linear ARDL framework may not fully reflect asymmetric or nonlinear responses; and some usual determinants of money demand were not explicitly included.

Future research should consider using quarterly or monthly data, nonlinear ARDL or regime-switching models, and a wider specification including inflation, income, exchange rates, financial deepening, and digital financial development will be useful in future research. Cross-country comparisons between Sub-Saharan African countries would also add value.

This study advances existing knowledge by incorporating fiscal deficits and fiscal-issue government debt into a money-demand model with structural breaks and showing that the issuance of government debt by the government is an important transmission channel through which fiscal activities affect the monetary environment in Nigeria.

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