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Capital Market Dynamics, Macroeconomic Instability, and Economic Growth in Nigeria: A VECM–Quantile-on-Quantile Regression Approach

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Abstract- ***This study investigates the heterogeneous nexus among capital market development, macroeconomic instability, and economic growth in Nigeria over 1985–2022. Departing from prevailing ARDL-based frameworks, the study adopts a two-stage methodology: the Johansen–Juselius Multivariate Cointegration and Vector Error Correction Model (VECM) to identify long-run equilibrium dynamics, and the Quantile-on-Quantile Regression (QQR) framework (Sim and Zhou, 2015) to map the full distributional dependence between capital market variables, macroeconomic indicators, and economic growth. Using quarterly data on Market Capitalization (MCP), All Share Index (ASI), Number of Shares Traded (NOS), Inflation (INF), Exchange Rate (EXC), Fiscal Deficit (FD), and Government Debt (GD), results confirm four cointegrating vectors and a speed of adjustment of approximately 8.9 percent per quarter. QQR analysis reveals that the positive growth effect of market capitalization intensifies only when both variables are in upper quantile states, that inflation is most destructive during low-growth regimes, and that government debt has a non-monotonic, threshold-dependent relationship with growth. These findings carry significant implications for heterogeneity-aware capital market and macroeconomic policy in Nigeria.***

Index Terms- ***Capital Market, Economic Growth, Macroeconomic Instability, Nigeria, Quantile-on-Quantile Regression, VECM***

I. INTRODUCTION

A. Background

Financial market development and economic growth share a well-documented theoretical and empirical relationship, tracing back to Schumpeter (1911) and operationalised in modern growth theory by Levine (1997) and Beck and Levine (2004). For Nigeria—sub-Saharan Africa's largest economy—the capital market constitutes a critical institutional mechanism for mobilising long-term savings, allocating risk, and channelling investment toward productive activities. Since the establishment of the Nigerian Stock Exchange in 1960 and the successive reform waves of the 1980s through 2020s, the Nigerian capital market has grown substantially in nominal terms yet remains characterised by shallow depth, narrow breadth, persistent illiquidity, and acute vulnerability to macroeconomic shocks (Ariyo and Adelegan, 2005; Umar, 2022).

The macroeconomic environment compounds this challenge. Nigeria's inflation averaged over sixteen percent per annum across the study period; the Naira depreciated from approximately ₦2/US$ to over ₦900/US$; and fiscal deficits and government debt have expanded markedly since 2015 (CBN, 2022). These concurrent pressures motivate a rigorous empirical examination of whether capital market development can translate into sustained economic growth under chronic macroeconomic instability, and more importantly, under what distributional conditions such translation is most effective.

A critical limitation of the existing Nigerian empirical literature is its near-exclusive reliance on mean-based estimators—OLS, GMM, and especially ARDL bounds testing—which estimate average relationships and thereby obscure potentially important heterogeneities across the distribution of economic growth and capital market performance. The Quantile-on-Quantile Regression (QQR) framework resolves this by capturing the effect of the τ-th quantile of any independent variable on the θ-th quantile of GDP growth, producing a comprehensive (θ,τ) coefficient surface. No existing study has applied QQR to the capital market–growth nexus in Nigeria; this study fills that gap.

B. Problem Statement

Despite decades of reform—including the Structural Adjustment Programme (1986), NSE recapitalisation (2005), and the SEC Capital Market Master Plan (2015–2025)—Nigeria's capital market has not consistently translated growth in market capitalisation into improvements in real output. Market capitalisation fell from a peak of ₦13.5 trillion (2008) to below ₦4.5 trillion by 2010, and the economy recorded contractions in 2016 and 2020. Macroeconomic instability, characterised by high inflation, exchange rate volatility, fiscal deficits, and rising public debt, is widely identified as a binding constraint on capital market deepening and on the productive deployment of long-term capital. Yet the nature of this constraint is state-contingent: the relationship between capital market variables and economic growth almost certainly differs depending

on whether the economy is in a recession, moderate expansion, or boom phase. Conventional mean-based methods cannot detect this heterogeneity. This study addresses that methodological and empirical gap.

C. Objectives

1) Establish the long-run cointegration relationship among capital market, macroeconomic, and growth variables using the Johansen–Juselius framework.
2) Model short-run adjustment dynamics and speed of equilibrium correction via the VECM.
3) Map the quantile-specific effects of MCP, ASI, NOS, INF, EXC, FD, and GD on economic growth across the joint distribution of both variables using QQR.
4) Derive state-contingent policy implications for capital market and macroeconomic governance in Nigeria.

D. Significance

Theoretically, the study advances the endogenous growth framework by demonstrating that the finance–growth nexus is fundamentally distributional, not uniform. Methodologically, the VECM + QQR combination represents a significant advance over ARDL-based approaches. For policymakers—the SEC, CBN, and Federal Ministry of Finance—the findings enable the design of heterogeneity-aware, state-contingent policies calibrated to prevailing economic conditions rather than average-performance assumptions.

II. LITERATURE REVIEW

A. Theoretical Frameworks

The study is anchored in four theoretical pillars. The Endogenous Growth Model (Lucas, 1988; Romer, 1986, 1990) posits that growth is self-sustaining and internally generated through human capital accumulation, innovation, and institutional quality, with capital markets serving as enabling infrastructure for the allocation of growth-promoting investment. The Arbitrage Pricing Theory (Ross, 1976) establishes that macroeconomic factors are systematic risk determinants of asset returns, providing the theoretical basis for the two-way link between macroeconomic instability and capital market performance. The Efficient Market Hypothesis (Fama, 1970) underscores the conditions under which capital market prices accurately reflect productive capacity, while the Capital Asset Pricing Model (Sharpe, 1964; Lintner, 1965) links macroeconomic risk premiums to the cost of equity capital and therefore to the volume of investment-financed growth. Patrick's (1966) supply-leading and demand-following hypotheses frame the direction-of-causality question that the VECM Granger causality analysis addresses.

B. Empirical Evidence

At the global level, Levine and Zervos (1998) demonstrated that stock market liquidity and bank development are jointly and robustly associated with future economic growth in 47 countries. Beck and Levine (2004) confirmed independent positive effects of both financial intermediaries and equity markets on long-run growth using dynamic panel methods. Azimi (2022) found nonlinear, asymmetric effects of capital market depth on growth in China, while Antwi, Issah and Kpodo (2021) confirmed a positive long-run nexus for Ghana.

Within Nigeria, Ewah, Esang and Bassey (2009) found that capital market potential for growth promotion had not materialised owing to illiquidity and misappropriation of funds. Donwa and Odia (2010) found no significant impact of capital market indices on GDP using OLS. Conversely, Araoye, Ajayi and Aruwaji (2018), Anthony-Orji and Ogbuabor (2018), and Bello, Folorunsho and Alabi (2022) identified positive long-run relationships. The divergence in findings reflects both methodological variation and the genuine state-contingency of the relationship—a problem the QQR approach directly addresses.

On macroeconomic variables, Asaolu and Ogunmuyiwa (2011) found that money supply, exchange rate, and inflation jointly drive Nigerian stock market performance. Adaramola and Dada (2020) confirmed significant negative effects of inflation on growth, while Bittencourt (2011) documented inflation–financial development trade-offs. The absence of QQR studies on this topic for Nigeria constitutes the central literature gap.

III. RESEARCH METHODOLOGY

A. Data and Variables

Quarterly time-series data spanning 1985Q1 to 2022Q4 (152 observations) are sourced from the CBN Statistical Bulletin, NSE Annual Reports, National Bureau of Statistics, and World Bank WDI. The dependent variable is the logarithm of Real GDP (LRGDP). Capital market proxies are Market Capitalization (MCP), All Share Index (ASI), and Number of Shares Traded (NOS). Macroeconomic indicators are Inflation Rate (INF), Exchange Rate (EXC), Fiscal Deficit/GDP (FD), and Government Debt/GDP (GD).

B. Johansen–Juselius Cointegration and VECM

Given that all variables are I(1)—confirmed by ADF, PP, and KPSS tests—the Johansen (1988) and

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Johansen and Juselius (1990) maximum-likelihood cointegration framework is applied. The multivariate system is specified as:

$$\Delta Xt = \mu + \Pi Xt\text{-}1 + \Sigma_{i=1}^{p-1} \Gamma_i \Delta Xt\text{-}i + \varepsilon t \quad (1)$$

where $\Pi = \alpha\beta'$ encodes the speed of adjustment (α) and the cointegrating vectors (β). The rank r of Π, determined by trace and maximum-eigenvalue statistics, identifies the number of long-run equilibrium relationships. The VECM for LRGDP then takes the form:

$$\Delta LRGDPt = \alpha + \Sigma \beta_i \Delta Xt\text{-}i + \delta \cdot ECTt\text{-}1 + \varepsilon t \quad (2)$$

where ECTt-1 is the lagged error correction term and δ is the speed-of-adjustment coefficient (expected negative and significant). This approach is preferred over ARDL because it does not require pre-specified bounds, models all endogenous relationships simultaneously, and directly recovers the number of cointegrating vectors without assuming a single long-run equation.

C. Quantile-on-Quantile Regression (QQR)

The QQR framework of Sim and Zhou (2015) estimates the slope coefficient $\beta_1(\theta,\tau)$ defined by:

$$Q\theta(LRGDPt \mid Xt(\tau)) = \beta_0(\theta,\tau) + \beta_1(\theta,\tau) \cdot Xt(\tau) + \varepsilon t \quad (3)$$

where $Xt(\tau)$ is the τ-th quantile of the explanatory variable. $\beta_1(\theta,\tau)$ captures how the τ-th quantile of Xt affects the θ-th quantile of LRGDP, producing a full (θ,τ) coefficient surface. Estimation uses a local linear regression minimising a kernel-weighted quantile loss function with Gaussian kernel and Silverman (1986) bandwidth. This dual-quantile mapping reveals heterogeneities invisible to both standard quantile regression (which ignores the distribution of Xt) and mean-based methods.

IV. RESULTS AND DISCUSSION

A. Descriptive Statistics and Unit Root Tests

All Jarque-Bera statistics are significant at the 1% level, confirming non-normal distributions with excess kurtosis and skewness across all variables. This validates the use of quantile-based methods. ADF, PP, and KPSS tests unanimously confirm that all series are I(1)—non-stationary in levels but stationary after first differencing.

B. Johansen–Juselius Cointegration Results

Table 1: Johansen–Juselius Cointegration Results. ***, **, * = significant at 1%, 5%, 10%.

Null Hypothesis	Trace Stat.	CV (5%)	Max-Eigen Stat.	CV (5%)
r = 0	384.21***	197.37	112.44***	58.43
r ≤ 1	271.77***	159.53	87.32***	52.36
r ≤ 2	184.45***	125.62	71.18**	46.23
r ≤ 3	113.27**	95.75	52.63*	40.08
r ≤ 4	60.64	69.82	31.14	33.88

Both trace and maximum-eigenvalue statistics reject the null of at most three cointegrating vectors, confirming four stable long-run equilibrium relationships among the eight variables. This multi-dimensional cointegration confirms the appropriateness of the VECM framework and demonstrates that Nigeria's capital market, macroeconomic conditions, and real output are structurally bound in long-run equilibrium.

C. VECM Long-Run and Adjustment Results

Table 2: VECM Long-Run Normalised Coefficients and ECT. ***, **, * = significant at 1%, 5%, 10%.

Variable	Coefficient	t-Statistic	Interpretation
MCP	0.0423***	(4.87)	Market cap supports long-run growth
ASI	0.0018*	(1.78)	Share index modest positive LR effect
NOS	0.0091**	(2.34)	Trading volume supports LR growth
INF	-0.0267***	(-3.91)	Inflation significantly impedes growth
EXC	-0.0183**	(-2.65)	Depreciation constrains long-run growth
FD	-0.0144*	(-1.88)	Fiscal deficit has negative LR effect
GD	-0.0321***	(-4.10)	Government debt significantly constrains growth
ECT(-1)	-0.0891***	(-5.23)	~8.9% disequilibrium corrected per quarter

All capital market variables carry positive long-run coefficients, confirming their growth-promoting function when macroeconomic conditions are supportive. Market capitalisation has the largest and most significant positive coefficient, underscoring its role as the primary channel through which the capital market facilitates productive investment. Among macroeconomic variables, government debt has the largest negative coefficient (-0.0321), followed by inflation (-0.0267), indicating that Nigeria's expanding public debt burden and chronic inflationary environment are the most binding macroeconomic

constraints on long-run growth. The ECT coefficient of -0.0891 indicates that approximately 8.9 percent of any short-run disequilibrium is corrected each quarter, implying a full adjustment horizon of approximately 11 quarters—reflecting the structural rigidities characteristic of Nigeria's economy.

D. Quantile-on-Quantile Regression Results

The QQR analysis estimates $\beta_1(\theta,\tau)$ across $\theta \in \{0.10, 0.25, 0.50, 0.75, 0.90\}$ and $\tau \in \{0.10, 0.25, 0.50, 0.75, 0.90\}$ for each variable. The key findings are summarised below.

Table 3: Summary of QQR Coefficient Signs and Significance Across Quantile States.

Variable	Lower Quantile State (τ = 0.10–0.30)	Upper Quantile State (τ = 0.70–0.90)
MCP	Positive but insignificant across all θ — shallow markets cannot mobilise growth	Strongly positive and significant at upper θ — deep markets amplify high-growth regimes
ASI	Negative at most θ — market downturns suppress growth through wealth and confidence channels	Positive and significant at middle–upper θ — bull markets reinforce growth momentum
NOS	Positive but modest across θ — low-liquidity period has limited growth transmission	Significant positive effect at mid–upper θ — high trading volume improves capital allocation
INF	Modest negative, often insignificant — mild inflation may temporarily stimulate demand	Large and significant negative at lower θ — high inflation most destructive in weak-growth regimes
EXC	Mildly negative — depreciation ambiguous in oil-export economy	Large negative, esp. at lower θ — severe depreciation creates double adverse shock on growth
GD	Positive and significant — moderate debt finances productive public investment	Significant negative — high debt crowds out private investment and undermines confidence

The QQR results collectively reveal a pattern of distributional complementarity and vulnerability. The growth-promoting effect of capital market development is contingent on the economy already operating in a favourable distributional state; capital market instruments are not sufficient to independently lift the economy from its lower distributional positions. Conversely, macroeconomic instability—particularly high inflation and severe exchange rate depreciation—exerts its most damaging effects precisely when the economy is weakest, amplifying downturns and retarding recovery. The non-monotonic government debt result identifies a practical threshold beyond which Nigeria's public debt trajectory becomes growth-inhibiting, a finding of immediate policy relevance given debt-to-GDP trends since 2015. These distributional asymmetries, invisible to ARDL and OLS methods, constitute the study's primary empirical contribution.

E. Granger Causality

VECM-based Granger causality tests confirm bidirectional causality between market capitalisation and economic growth, lending joint support to the supply-leading and demand-following hypotheses. Unidirectional causality runs from inflation and exchange rate to economic growth, establishing macroeconomic instability as an antecedent condition rather than a consequence of weak output at the quarterly frequency.

V. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

A. Summary

Using 152 quarterly observations over 1985–2022, this study applied Johansen–Juselius cointegration, VECM, and QQR to examine the distributional relationship between capital market development, macroeconomic instability, and economic growth in Nigeria. Four cointegrating vectors confirm structural long-run linkages. VECM results identify MCP, ASI, and NOS as positive long-run growth drivers and INF, EXC, FD, and GD as negative constraints, with a moderate speed of adjustment of 8.9 percent per quarter. QQR analysis reveals that these relationships are strongly heterogeneous: the capital market–growth complementarity is realized only in upper-quantile distributional states for both variables; inflation and exchange rate volatility are most destructive during low-growth regimes; and government debt has a non-monotonic effect with a meaningful threshold beyond which it impedes rather than supports growth.

B. Conclusion

Nigeria's capital market reforms have expanded market infrastructure but their growth-enhancing potential remains constrained by chronic macroeconomic instability. The QQR findings demonstrate that this is not a simple linear relationship: capital market depth and macroeconomic stability are complementary, and each reinforces the efficacy of the other. Policies that develop the capital market in isolation from macroeconomic stabilisation will have limited impact, while macroeconomic reforms that ignore capital market deepening will forgo an important growth transmission channel. A coordinated, heterogeneity-aware policy architecture addressing both dimensions simultaneously is therefore essential for Nigeria to realise the full growth potential of its capital market.

C. *Policy Recommendations*

- Inflation targeting: The CBN should adopt a formal inflation-targeting regime to anchor expectations and reduce the severe growth costs of high-inflation episodes identified at lower growth quantiles.
- Capital market deepening: The SEC and NGX should incentivise large-firm listings, develop derivatives markets, and attract long-term institutional investors to expand market capitalisation and liquidity into upper quantile states where growth complementarities are strongest.
- Fiscal consolidation: The Federal Ministry of Finance and Debt Management Office should pursue credible medium-term debt reduction to remain below the non-monotonic threshold at which government debt becomes growth-inhibiting.
- Exchange rate predictability: CBN exchange rate policy should reduce abrupt depreciation episodes, which QQR results show are most damaging during low-growth regimes.
- State-contingent policy design: Macroeconomic and capital market policies should be calibrated to the prevailing distributional state of the economy, applying more intensive stabilisation tools during lower-quantile growth phases and deploying capital market deepening measures most aggressively during stable, upper-quantile phases.

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