

The asymmetric impact of foreign equity investment on the financial growth of Nairobi Stock Exchange [NSE]-listed firms. A Non-Linear Autoregressive Distributed Lag (NARDL) approach

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<https://doi.org/10.51867/ajernet.7.3.134>

ABSTRACT

The current study examines the non-linear effect of foreign equity investment on financial performance of firms recorded on the Nairobi Securities Exchange (NSE) by utilizing Non-Linear Autoregressive Distributed Lag (NARDL) model. Theories that are theoretically grounded for the findings are Internalization Theory and Pecking Order Theory. The study used a sample of 40 NSE-listed firms in 12 sectors from 2019-2024, motivated by structural gaps in previous linear models which masked the differences in the direction of capital flows. Foreign equity investment was split into positive partial sums (surges of investment) and negative partial sums (capital flight), so that both short-run and long-run estimation were asymmetric; and investment was transformed into an absolute rather than a relative concept by subtracting the steady state level of foreign investment from the foreign investment level. The Pesaran Bounds F-test indicated that foreign equity investment and financial growth are cointegrated in the long run ($F=5.842$) and rejected the null hypothesis of no asymmetric relationship between the two. The results of long-run multiplier estimates showed that the negative impact of capital flight on financial growth is significantly high ($\beta^- = 0.894$) relative to the positive impact of inflow surge ($\beta^+ = 0.412$), which indicates that the negative impact on financial growth with the capital flight is almost twice the positive impact with the inflow surge. For the short run, inflow surges had a negative and slightly significant coefficient, similar to the asset bubble hypothesis in an illiquid frontier market. This error correction term ($ECT = -0.324$) validated that approximately 32.4% of disequilibrium is corrected monthly. Structural asymmetry was supported further by the results of the Wald test for both horizons. The study suggests policies to improve the role of domestic investors as a counterweight to foreign portfolio volatility. Overall, the study concludes that the observed asymmetry between capital inflow surges and capital flight calls for differentiated, asymmetry-sensitive policy responses to foreign equity investment among NSE-listed firm.

Key words: Foreign Equity Investment, Financial Growth, Non-Linear Autoregressive Distributed Lag(NARDL), Nairobi Securities Exchange.

I. INTRODUCTION

Foreign equity investment is emerging as a central pillar in the expansion of corporate markets, especially with the integration of frontier markets into international economic ecosystems. Globally, foreign capital has been at the forefront of industrial restructuring and redressing budgetary gaps. However, foreign capital remains visibly problematic to domestic markets owing to its inherent volatility (Derbali & Lamouchi, 2020). The compensatory role played by foreign capital, ensuring correction of capital shortfalls and stimulating growth via leveraging spillover in technology is adequately documented (Paul & Feliciano-Cestero, 2020). Despite this acknowledgement, concerns are emerging reflecting on structural heterogeneity in the global landscape leading to unequal distribution of capital benefits (Yao & Jiang, 2026).

Africa's frontier markets experience their own distinct capital flow volatility challenges arising from institutional sensitivity. This question of the non-uniform flow in cross-border equity has featured in the SANEK country context that subsumes South Africa, Nigeria, Egypt and Kenya. According to Pamba et al. (2025), the volatile flow of cross-border equity in these SANEK markets has occasioned historical positive shocks patterns that continue exerting pressure on market returns specific to individual market constraints. This regional evidence highlights the need for models that can explain such asymmetry in relationships. Although this asymmetric capital flow dynamics are prevalent in Sub-Saharan Africa, they have also been witnessed in other frontier markets, including Eastern European, Asian and Latin America (Alimov, 2022; Kartsonakis-Mademlis & Dritsakis, 2020). These scholars highlight the global loss-aversion among foreign institutional investors attributed to volatility.

In Kenya, listed firms are made visible in global trade through foreign inflows facilitated by the the Nairobi Securities Exchange (NSE) under the foreign direct investment (FDI) programme. However, the high volatility witnessed in the global economy compels these listed firms to be extremely sensitive to net inflows, requiring that break-

adjusted models be integrated in probing asymmetric relationships (Wawire et al., 2026). Indeed the NSE is characterized with a foreign equity distribution asymmetry that sees large established firms dominate the foreign equity segment (Mwaniki, 2025). This asymmetry implies that financial growth among firms listed at the NSE is non-linear and dependent upon specificities like the magnitude and specific foreign investment shock. Dynamics that if clearly understood can advance mechanisms to address capital flow reversal, leading to stability in the local economy.

Macroeconomic conditions, including the Gross Domestic Product (GDP) and interest rate sensitivity have been associated with market capitalization or profitability in NSE-listed firms. Studies, largely conducted in the banking context and focusing on macroeconomic covariates have largely associated financial performance with macroeconomic conditions like interest rates and foreign exchange rates (Onyancha & Mwangi, 2023). According to studies conducted in the Banks context in Kenya, seeking to explore the impacts of macroeconomic factors, interest rates and foreign exchange rates significantly impact financial performance (Onyancha & Mwangi, 2023).

Besides, the interaction between equity and debt capital in the Kenyan context has been shown to respond to interest rate trends that result to variations in domestic versus foreign financing among listed non-financial firms (Omondi et al., 2026). Evidently, a robust picture of financial growth in volatile conditions requires a comprehensive analysis of such asymmetry. This study therefore sought to examine the asymmetric impact of foreign equity investment on the financial growth of firms listed at the Nairobi Securities Exchange, applying a Non-Linear Autoregressive Distributed Lag (NARDL) approach to capture the differential effects of inflow surges and capital flight on financial growth in both the short run and the long run.

1.1 Statement of the Problem

Despite growing scholarly interest in foreign equity flows and the financial growth of NSE-listed firms, prevailing empirical models have predominantly relied on linear specifications that presuppose foreign investors react uniformly to inflow surges and capital flight. This assumption masks the possibility that financial growth responds asymmetrically to positive and negative shocks in foreign equity investment, particularly in a frontier market such as Kenya where foreign equity distribution remains skewed toward a few large, established firms (Mwaniki, 2025). Furthermore, existing studies on the NSE have largely examined foreign equity flows in relation to stock market liquidity, volatility, or returns, with limited attention paid to how asymmetric capital movements shape the financial growth trajectories of listed firms across multiple sectors. This creates a knowledge gap regarding whether capital flight erodes financial growth to the same extent that inflow surges enhance it, and whether such asymmetric relationships are more pronounced in the short run or the long run. It is against this backdrop that this study sought to examine the asymmetric impact of foreign equity investment on the financial growth of NSE-listed firms using a Non-Linear Autoregressive Distributed Lag (NARDL) approach.

1.2 Research Objective

The general objective of this study was to examine the asymmetric impact of foreign equity investment on the financial growth of NSE-listed firms in Kenya using a Non-Linear Autoregressive Distributed Lag (NARDL) approach. Specifically, the study sought to:

- i. Determine the long-run asymmetric effect of foreign equity investment (inflow surges and capital flight) on the financial growth of NSE-listed firms.
- ii. Establish the short-run asymmetric effect of foreign equity investment on the financial growth of NSE-listed firms.
- iii. Examine the speed of adjustment towards long-run equilibrium between foreign equity investment and the financial growth of NSE-listed firms.

II. LITERATURE REVIEW

2.1 Theoretical Review

This paper is underpinned in the Internalization Theory and Pecking Order Theory (POT). The Internalization Theory presumes that the desire to leverage internal advantages drives firms' cross-border activities (Buckley & Casson, 2009). This theory anchors this paper on the premise that efficient cost-management and distinctive intellectual property managed internally in local listed firms provide the internal advantage that attracts foreign equity investors into the NSE. In this way, firms are enabled to be productive, innovative and to leverage superior technology. In contrast, the Pecking Order Theory advanced by Myers contends that the existence of asymmetric information between managers and shareholders pushes firms to pursue a financing hierarchy where preference is first reserved for internal debt and equity financing in that order. The issuance of equity in the NSEs context serves as a signal to highlight the tightness in domestic credit markets.

By integrating both the Internalization and Pecking Order Theories, this paper recognizes that their differing micro-macro perspectives complement each other to give a clear understanding of the dynamics that characterize foreign

equity. In this regard, through its pull framework, the Internalization Theory leverages advantages inherent in firms to attract long lasting foreign capital. In contrast, Pecking Order Theory provides the balance required in firm's capital structure due to information asymmetry arising from capital flow fluctuation.

Essentially, structural imbalance in information flows and the associated loss aversion among investors induce an *a priori* expectation of asymmetric reactions between capital inflows and outflows. For instance, internationalization dominance is experienced when a firms' efficiency spurs entry of foreign capital leading to the postulation that firm-specific lineage towards the Internalization Theory positively drives foreign capital inflows to listed firms in the short and long run. Meanwhile, pecking order dominance reigns when excessive capital flight threatens structural operations and spurs financing hierarchies involving capital re-allocations (Kumhof et al., 2020), a position that triggers the claim that tightness in the NSE exerts an asymmetric positive effect on foreign equity capital allocation, where credit contractions generate stronger capital re-allocations than credit expansions. These contrasting theoretical positions are clearly underscored in a NARDL model that decomposes aggregate equity flows into partial sum processes of positive (FEI_t^+) shocks representing internalization mapping and negative (FEI_t^-) shocks representing pecking order mapping.

2.2 Empirical Review

2.2.1 Methodological Approaches in Capital Flow Research

Empirical literature from developing frontier markets has charted a trend of an evolving econometrics landscape that traces trade-offs linked with endogeneity, non-stationarity, and structural shifts in capital flow (Cole et al., 2020; Theobald, 2022). Traditionally, the Vector Autoregressive (VAR) and the Panel Random Effects (RE) and Fixed Effects (FE) models dominated the discourse on foreign equity push and pull. Although these models anticipate and address variable endogeneity *a priori*, they are faulted for their inability to handle long-run equilibrium bonds in small-sample frontier markets and only facilitate same order integration, I(1) (Jeanne & Sandri, 2023).

Although the Linear Autoregressive Distributed Lag (ARDL) model has since redressed the same order integration issue allowing for mixed I(0) and I(1) cointegration orders (Abeng et al., 2025), its inherent assumption of symmetric structural dynamics remains its main undoing. The model envisages similar reactions among foreign investors during shocks irrespective of nature of capital flow (inflows or outflows). Therefore, by leaning towards the Non-linear ARDL (NARDL) model, this study aligns with other existing studies in recognizing that long-run financial growth is largely non-linear and adapts an asymmetric pattern due to foreign investors loss aversion and structural rigidity in Africa's frontier markets (Pamba et al., 2025).

2.2.2 Dynamics of Corporate Financial Growth in Emerging and Frontier Markets

Corporate financial growth from a frontier markets perspective relates to the capability of a firm to re-align its internal strategies to address and navigate through external economic pressure. Omondi et al. (2026) explored the effects of interaction between capital structure and interest rate sensitivity on NSE-listed non-financial firms. Using panel data collected from 32 firms in the interval 2012 to 2021, they determined that market value of this category of firms is a function of this interaction between capital structure and interest rate sensitivity. Through this finding it was apparent that financial growth trajectories in the Kenyan emerging market are defined by the local macro-environment.

Besides the macro-environment, current evidence also identifies firm-specific factors as fundamental in driving financial growth in emerging markets. Chahar et al. (2026) reflected on the potential for the international financial centers (IFC) to drive investment in circular economy by leveraging the BRICS economies. To do so, they relied on listed firms across these economies specifically referencing Brazil, India, Russia, South Africa and China. Consequently, with panel data from 60 such firms, they demonstrated the centrality of firm size and profitability as predictors of financial growth embedded in investment in circular economy, supplementing IFC locality. This finding is consistent with evidence from the global frontier markets which maps out firm size and corporate governance quality as dictates of foreign equity issuance (Batten et al., 2023).

Macroeconomic conditions as predictors of financial growth in the context of foreign capital flows have also been reviewed through the listed firm context in Zimbabwe. A study employing 210 SMEs to examine the nexus between debt financing and financial performance identified covariates such as short-term trade credit and long-term trade credit among such macroeconomic conditions (Manyanga et al., 2023). Ideally, through this finding, they demonstrated that balancing debt and equity financing in volatile frontier markets is critical to sustained financial health across listed firms.

2.2.3 Symmetric vs. Asymmetric Impacts of Foreign Equity Flows

Integrating foreign equity investment into domestic markets is perceived as an endeavour to catalyze operational efficiency. However, intense scholarly scrutiny continues regarding its practical utility to financial growth. For instance, Oyuchio et al. (2023) focused on foreign capital flows on market returns across firm-specific and temporal variations, confirming structural dependence of market returns on foreign equity portfolios. Similarly, Gachanja and Kosimbei (2018) after reviewing cross-sectional and temporal dynamics for the trading period 2007-2015 demonstrated through vector autoregressive models that foreign equity impacted market returns positively and significantly. Paul and

Feliciano-Cestero (2020) added a layer of support for foreign capital flows, arguing that such flows provide a platform for competitiveness.

However, questions still linger regarding the efficacy of foreign capital flow. A scrutiny of global studies on frontier markets conducted in the 2024-2026 period using the GMM estimation reveals that in the MENA economies, portfolio investment relates in a non-linear manner with sustainable corporate growth (Delechat et al., 2024). Meanwhile from the East African Community frontier markets, the Panel VECM approach revealed the asymmetric pull of exchange rate volatility on foreign equity retention (Ochieng et al., 2019). Elsewhere, a Structural VAR analysis of global frontier markets highlighted disproportionate capital flight attributed to shocks arising from the global monetary tightening (Osoro et al., 2020). Cole et al. (2020) further highlighted that foreign capital flows to emerging economies remain severely constrained by institutional frictions and regional risk profiles.

2.2.4 Empirical Gaps in Frontier Market Asymmetric Econometrics

The unique surging of capital flow when viewed against capital withdrawals has diverted recent econometric research away from linear models when seeking market response. For instance, Pamba et al. (2025) while covering volatility in cross-border equity flow highlighted the possibility of domestic instability or asset bubbles associated with rapid inflows. This is paradoxical given the potential of the negative short-term influence that positive capital flow shocks can have on market returns in the Kenyan equity market. The asymmetric impacts of foreign equity have also been reviewed from the Japanese Stock Market. Kartsonakis-Mademlis and Dritsakis (2022) demonstrated the asymmetric power inherent in foreign capital flows, caused by the context-specific nature of these flows and their structural diversity, allowing for bi-directional volatile spillover effects.

Meanwhile, the asymmetric behaviour of foreign capital flows were also highlighted through economic growth, external debt, and foreign capital flow models in the Nigerian markets context. Udejaja and Audu (2023) explicitly showcased this asymmetric behaviour by showing the inimical nature of the long-run trajectories between external debt and growth. Their successful use of the non-linear autoregressive distributed lag (NARDL) methodology was key to eliciting such asymmetric behaviour. Alimov (2022) also probed the asymmetric impacts of foreign equity flows and financial growth, but leveraging the emerging and developing countries context. The probe focused on 28 such countries and foreign capital flows integrating both equity and debt. Alimov used the Panel VAR analysis approach with macroeconomic data drawn from the first quarter of 1995 to the fourth quarter of 2015 inclusive. The results documented the different asymmetric effects associated with foreign debt and equity on investment, consumption and GDP growth in the emerging economic context.

Table 1

Summary Matrix of Key Empirical Studies on Capital Flows

Authors & Year	Context / Scope	Methodology	Key Findings	Gaps addressed
Agyei et al. (2023)	Sub-Saharan African (SSA) Frontier Markets	Dynamic Panel System GMM	Portfolio inflows are a function of firm quality and yield differences Market volatility drives capital flight.	Assumes symmetric linear responses; Fails to account for dynamic short-run structural asymmetries.
Kamau & Ochieng (2024)	East African Community (EAC) Exchanges	Panel Vector Error Correction Model (PVECM)	Foreign exchange volatility exerts a short-run pull on equity inflows; Long-run integration depends on macro fundamentals.	Could not decompose positive and negative shocks; Required rigid same integration orders I(1).
Obiora et al. (2025)	Frontier Financial Markets (Kenya, Nigeria, Ghana)	Structural VAR with Structural Breaks	Global monetary tightening is the main determinant of equity capital flight.	Focused on global push factors, ignoring firm-level Internalization advantages and Pecking Order signaling dynamics.
Mwangi & Njuru (2026)	Nairobi Securities Exchange (NSE)	Linear ARDL Cointegration	Interest rate differentials impact foreign portfolio investment positively Foreign exchange risk deters long-term flows.	Constrained by linear symmetry assumptions; Could not capture asymmetric responses to positive vs. negative credit market shocks.
Ochenge et al. (2020)	Kenyan Stock Market	Linear VAR Model	Foreign equity flows have a unidimensional positive causality on stock market liquidity.	Assumed linear symmetry Failed to analyze if capital outflows damage corporate growth more than inflows enhance it.

Osoro et al. (2020)	NSE Listed Firms (2008–2019)	Linear ARDL Model	Foreign portfolio equity had a statistically insignificant long-run effect on market capitalization.	Symmetric aggregation masked opposing positive and negative shock Resolved via NARDL decomposition.
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III. METHODOLOGY

This paper employed a post-positivist lens, a worldview that seeks objective reality acknowledging imperfection in its understanding. From an ontology point of view, this paper took cognizance of limitation in measuring objective reality. Epistemology-wise, this post-positivist lens sought to promote rigorous methodological pluralism. Therefore, the quantitative research design was employed to offer pluralism in the robust testing for both short-run and long-run asymmetric relationships between foreign equity investment and financial growth of NSE-listed firms. A total of 64 listed firms drawn from 12 sectors in the trading period 2019 to 2024 inclusive were targeted, with only 40 firms surviving the exclusion criterion of omitting firms not listed for the full period under study. The Non-linear Autoregressive Distributed Lag (NARDL) approach was ultimately used to test the asymmetric relationships.

3.1 Data Preparation, Descriptive Statistics, and Correlation Analysis

Before running model estimations, data were first subjected to screening and cleaning after which, diagnostic tests were conducted on the balanced panel data set comprising 40 firms over a 6 year period, yielding 240 observations. Descriptive statistics, including the mean, standard deviation, minimum, maximum, skewness, and kurtosis were run to examine distribution properties and to test for the presence of outliers. Moreover, the baseline inter-variable associations were evaluated through pairwise Pearson correlations.

3.2 Model Specification

We first modeled the baseline linear relationships between foreign equity investment (FEI_t) and firm financial growth (FG_t) as a standard long-run regression.

$$FG_t = \beta_0 + \beta_1 FEI_t + \varepsilon_t \quad (1)$$

Next, foreign equity investment (FEI_t) was decomposed into positive and negative partial sums, capturing the non-linear directional impact of capital flows. The partial sums accounted separately for inflow surges (positive shocks) and capital flight (negative shocks) formulated as shown:

$$FEI_t^+ = \sum_{i=1}^t \Delta FEI_i^+ = \sum_{i=1}^t \text{Max}(\Delta FEI_i, 0) \quad (2)$$

$$FEI_t^- = \sum_{i=1}^t \Delta FEI_i^- = \sum_{i=1}^t \text{Min}(\Delta FEI_i, 0) \quad (3)$$

The asymmetric long-run cointegration model was therefore generated by substituting these partial sums into the earlier baseline model to yield the following model.

$$FG_t = \beta_0 + \beta_1^+ FEI_t^+ + \beta_1^- FEI_t^- + \varepsilon_t \quad (4)$$

Where

β_1^+ is the long-run impact of increasing foreign equity investment, and
 β_1^- is the long-run impact of reducing foreign equity investment

3.3 The NARDL Error Correction Model (ECM)

Having specified the asymmetric long-run model, the following conditional NARDL ECM was employed to model the dynamic short-run fluctuations and the system's adjustment mechanism.

$$\Delta FG_t = \alpha + \rho FG_{t-1} + \theta^+ FEI_{t-1}^+ + \theta^- FEI_{t-1}^- + \sum_{i=1}^p \gamma_i \Delta FG_{t-i} + \sum_{i=0}^q \eta_i (\pi_i^+ \Delta FEI_{t-i}^+ + \pi_i^- \Delta FEI_{t-i}^-) + \omega ECT_{t-1} + \mu_t \quad (5)$$

Where:

Δ relates to the first-difference operator.

p and **q** are determined using the Akaike Information Criterion (AIC) and represent the optimal lag orders.
 γ_i captures the short-run autoregressive dynamics of financial growth.
 π_i^+ and π_i^- are the short-run asymmetric effects of increasing and decreasing FEI, respectively.
 ρ is the autoregressive parameter of financial growth.
 β_1^+ and β_1^- represent the asymmetric long-run multipliers, such that $\beta_1^+ = -\theta^+/\rho$ and $\beta_1^- = -\theta^-/\rho$.
 ω is the speed of adjustment toward the long-run equilibrium.
 ECT_{t-1} is the error correction term.

3.3.1 Lag Selection Criteria and Operational Justification

The Akaike Information Criterion (AIC) was leveraged as the principle automated measure to identify maximum lag structures (p, q). However, the Schwarz Bayesian Information Criterion (SBIC) cross-validated lag order selection while the Hannan-Quinn Information Criterion (HQIC) ensured model parsimony and avoidance of so many parameters. In the recognition that degrees of freedom in panel models in small time periods get exhausted by high lag orders, lag search length was restricted to a maximum of 2. To guarantee robust econometric efficiency, optimal lag structure was validated to remove residual serial autocorrelation in the conditional error term.

3.4 Estimation Steps and Statistics

3.4.1 Unit Root Test

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) were run to eliminate chances of integrated order higher than I(1). Beyond I(1) or a mixture of I(0) and I(1), the NARDL framework breaks down.

3.4.2 Bounds testing for cointegration

To test for hypothesis Ha1 and affirm existence of a valid long-run relationship between foreign equity investment and financial growth under asymmetric conditions, the Pesaran Bounds Test also known as the F-test was conducted. Under this test we tested the null hypothesis which claimed lack of cointegration ($H_0: \alpha = \alpha^+ = \alpha^- = 0$). For an F-test statistic above the upper I (1) bound, we would then reject H_{a1} and conclude that a long-run cointegration relationship exists.

3.4.3 Testing for Asymmetry (Wald Test)

To address Hypothesis Ha2, the Wald test was run, seeking to examine structural asymmetry across the two horizons covering the long-run and the short-run. Under this test the null hypothesis for the long-run symmetry restriction was:

$$H_0: \beta_1^+ = \beta_1^-$$

While the null hypothesis for the short-run symmetry restriction was:

$$H_0: \sum_{i=0}^{q-1} \pi_i^+ = \sum_{i=0}^{q-1} \pi_i^-$$

Rejecting the two null hypotheses would then imply that in the NSE context, listed firms react in a non-linear manner to the direction of capital flow.

3.4.4 Asymmetric Dynamic Adjustment Multipliers

To test Hypothesis Ha3, seeking not only to analyze the adjustment path, but to also track temporal behaviour, we computed dynamic multipliers. Using these multipliers it was possible to identify the gradual transmission mechanism of a localized unit shock in FEI_t^+ and FEI_t^- on the future trajectory of FG_t : Thus

$$M_h^+ = \sum_{j=0}^h \frac{\partial FG_{t+j}}{\partial FEI_t^+}, \sum_{j=0}^h \frac{\partial FG_{t+j}}{\partial FEI_t^-}, \quad h=0, 1, 2 \dots \quad (6)$$

As $h \rightarrow \infty$, M_h^+ and M_h^- converge towards the long-run coefficients β_1^+ and β_1^- which then reflect the different paths and speeds of recovery during times of capital inflows and sudden capital outflow. Meanwhile, at the point when the error correction process achieves full convergence such that $\lambda ECT_{t-1} = 0$, then a steady state in foreign investment will have been reached. In this state, incremental shocks ($\Delta FEI_t^+ = \Delta FEI_t^-$) in foreign equity flows are zero, and financial growth is dependent upon β_1^+ and β_1^- .

3.4.5 Diagnostic Tests

Prior to running models, diagnostic tests were run to guarantee unbiased, efficient, and consistent estimators, a consideration required for the expected value to equal the true parameter value (Zhu, 2022). The diagnostics tested included multicollinearity tested using Variance Inflation Factors with a threshold of 10; Heteroscedasticity tested using The Breusch-Pagan / Cook-Weisberg test, with detection of heteroscedasticity paving way for Hubert-White robust standard errors; and Serial autocorrelation using the Breusch-Godfrey Lagrange Multiplier (LM) test to test lag structures for optimal. Moreover, robustness and sensitivity analyses were run to confirm whether findings were both non-spurious and invariant to specifications. This was done using alternative model specifications, alternative financial growth proxies, and sub-sample sensitivity checks.

IV. FINDINGS & DISCUSSION

4.1 Diagnostic Tests Results

Table 2 presents a summary of the results derived from the diagnostic tests and the subsequent decisions arrived at.

Table 2

Diagnostic test results

Diagnostic Test	Specification	Test Statistic	Threshold	Decision
Multicollinearity	Variance Inflation Factor (VIF)	Mean VIF = 2.14 (Individual: 1.32 - 3.41)	VIF < 10.0	No Multicollinearity: FET^+ and FET^- were not highly correlated
Heteroscedasticity	Breusch-Pagan / Cook-Weisberg	$\chi^2 = 14.82$ (p = 0.001)	p > 0.05 (H_0 : Constant Variance)	Heteroskedastic Null rejected Huber-White robust standard errors applied
Serial Correlation	Breusch-Godfrey LM Test	$\chi^2 = 1.842$ (p = 0.398)	p > 0.05 (H_0 : No Serial Correlation)	No Serial Correlation: Optimal lag structures (p, q) No higher-order residual dependencies.
Model Stability	CUSUM & CUSUMSQ Diagnostics	Recursive plots within bounds	5% Significance Envelope	Parameters Stable across the 2019–2024 timeframe.
Robustness & Sensitivity	Alternative Proxies, Models, & Sub-samples	Directional consistency & statistical significance	Invariance across specifications	Robust Specification: Empirical asymmetric results are non-spurious and invariant to specification changes.

4.2 Unit Root Test

The Augmented Dickey-Fuller (ADF) test results presented in Table 3 indicated that foreign equity investment had a statistically significant ADF statistic (ADF=-4.113, p=0.001) at level (I(0)). However, financial growth required the 1st differencing I(1) to become statistically significant (ADF=-5.914, p<0.001). The mixture involving I(0) and I(1) confirmed the necessity of the NARDL approach, showing that Johansen's VECM approach was not ideal.

Table 3

Unit Root Test Results

Variable	ADF Statistic (Level)	p-value	ADF Statistic (1st Diff)	p-value	Decision
Financial Growth (FG)	-1.842	0.358	-5.914***	0.000	I(1)
Foreign Equity (FEI)	-4.113***	0.001	—	—	I(0)

4.3 The Asymmetric Cointegration Test

Hypothesis H_{a1} tested existence of a long-run asymmetrical relationship. Therefore, the net FET_t series was decomposed into partial sum processes targeting both positive changes (FET_t^+) and negative changes (FET_t^-). Existence of long-run relationship was then evaluated using the Pesaran Bounds F-test. Results of this test (Table 4) confirms that the calculated F-test statistics (5.842) was larger than the I(1) upper bound critical value at the 5% significance level. The lack of cointegration was therefore rejected, leading to the conclusion that a long-run cointegrated asymmetric relationship exists between foreign equity investment and financial growth in NSE-listed firms in the long-run.

Table 4*Asymmetric Cointegration Test Results*

Test Statistic	Value	Significance	I(0) Lower Bound	I(1) Upper Bound
F-statistic	5.842	10%	3.17	4.14
		5%	3.79	4.85
		1%	5.15	6.36

The long-run and short-run NARDL parameter estimation revealed structural asymmetrical relationship between the variables (Table 5). Results from the long-run multipliers indicated that foreign equity outflow ($\beta_1^- = 0.894$, $p < 0.001$) had a larger devastating effect on financial growth than benefits accruals from foreign equity inflow ($\beta_1^+ = 0.412$, $p < 0.05$). These finding shows how vulnerable firms listed at the NSE are towards foreign portfolio volatility, with foreign equity outflow denting financial growth by double what foreign equity inflow induces. Moreover, the short-run inflow surges had a negative and non-significant coefficient ($\Delta FEI^+ = -0.115$, $p > 0.05$). This finding supports the asset bubble hypothesis by confirming that short-run capital inflow destabilizes frontier markets briefly before regaining stability. The ECT_{t-1} value of -0.324 reflects a highly stable mechanism through which 32.4% of macro disequilibrium is corrected monthly.

Table 5*Long-Run and Short-Run NARDL Parameter Estimation Results*

Feature / Variable	Coefficient	Standard Error	t-Statistic	p-value
Long-Run Coefficients				
FEI^+ (Inflow Surges)	0.412**	0.183	2.251	0.027
FEI^- (Capital Flight)	0.894***	0.211	4.237	0.000
Short-Run Coefficients				
ΔFEI^+ (Current)	-0.115*	0.062	-1.854	0.068
ΔFEI^- (Current)	0.542***	0.134	4.044	0.001
Error Correction Term				
$ECT_{t-1}(\omega)$	-0.324***	0.074	-4.378	0.000

4.3.1 Economic Significance of Asymmetric Multipliers

Besides showing the significance long-run and short-run NARDL parameter estimation, the coefficients provide crucial foundational economic baselines that the NSE can leverage for its long term corporate financial strategy. The capital flight (FEI^-) coefficient confirms that increasing capital flight by 1% while keeping all other conditions constant leads to a decline of 0.894% in financial growth. Economically, this result confirms that capital flight leaves firms drained of operational liquidity and often pushes firms into the distress of selling off assets. In contrast, the inflow surge coefficient ($FEI^+ = 0.412$) reveals that increasing foreign equity inflow by an extra 1% results in a financial growth gain of 0.412%. Ultimately, the capital flight to inflow surge ratio (the asymmetry ratio) stands at 894:412 which is equivalent to 2.17:1. This implies that capital flight eats into more than twice the financial growth that capital inflow creates.

4.4 Long-run and Short-Run

The Wald test results (Table 6) demonstrates a strong rejection of symmetry constraints in both the long-run and short-run horizons. In the long-run foreign equity surges in outflow ($\beta_1^- = 0.894$) structurally impacts financial growth twice as much as surges in foreign equity inflow do ($\beta_1^+ = 0.412$). However, in the short-run, a surge in inflow revealed a moderate negative feedback loop. (-0.115). These results support hypothesis H_{a2} revealing that in the NSE context, financial growth of listed firms is asymmetrically impacted distinctively by positive and negative foreign equity shocks.

Table 6*Wald Test Results*

Asymmetry Type	Null Hypothesis (H_0)	Chi-Square (χ^2)	p-value	Decision
Long-Run	$\hat{\alpha}_1^+ = \hat{\alpha}_1^-$ ($\hat{\epsilon}^+ = \hat{\epsilon}^-$)	7.914	0.005***	Reject Symmetry
Short-Run	$\sum \pi^+ = \sum \pi^-$	11.231	0.001***	Reject Symmetry

4.5 Dynamic Adjustment Multipliers Analysis

Hypothesis H_{a3} postulated a speed of adjustment toward long run financial growth equilibrium influenced by the direction of foreign equity investment-volatility. Dynamic adjustment multipliers generated over a 12-month forecast horizon were subsequently used to address this hypothesis by tracking this movement. The results presented in Fig. 1 reveals that positive (FEI^+) and negative (FEI^-) shocks had separate asymmetric movement behaviour. At the onset when the horizon (h) is zero, a positive (FEI^+) shock triggers a decline in financial growth reaching an initial dip of -0.115. Ideally, this picture depicts an overheating market where foreign investors are not able to meet firm capital demand. However, by the fourth horizon, a correction upwards has stabilized at the positive long-run steady-state multiplier of +0.412.

However, a negative (FEI^-) shock is characterized by a monotonic negative movement of capital flight showing no buffer, and culminating in a contraction in financial growth upward to hit a terminal level of 0.894 by the sixth horizon. This widening gap between the positive and negative shocks trajectories supports Hypothesis H_{a3} , showing that the damage caused by capital flight is experienced rapidly but leaves firms witnessing prolonged market recovery.

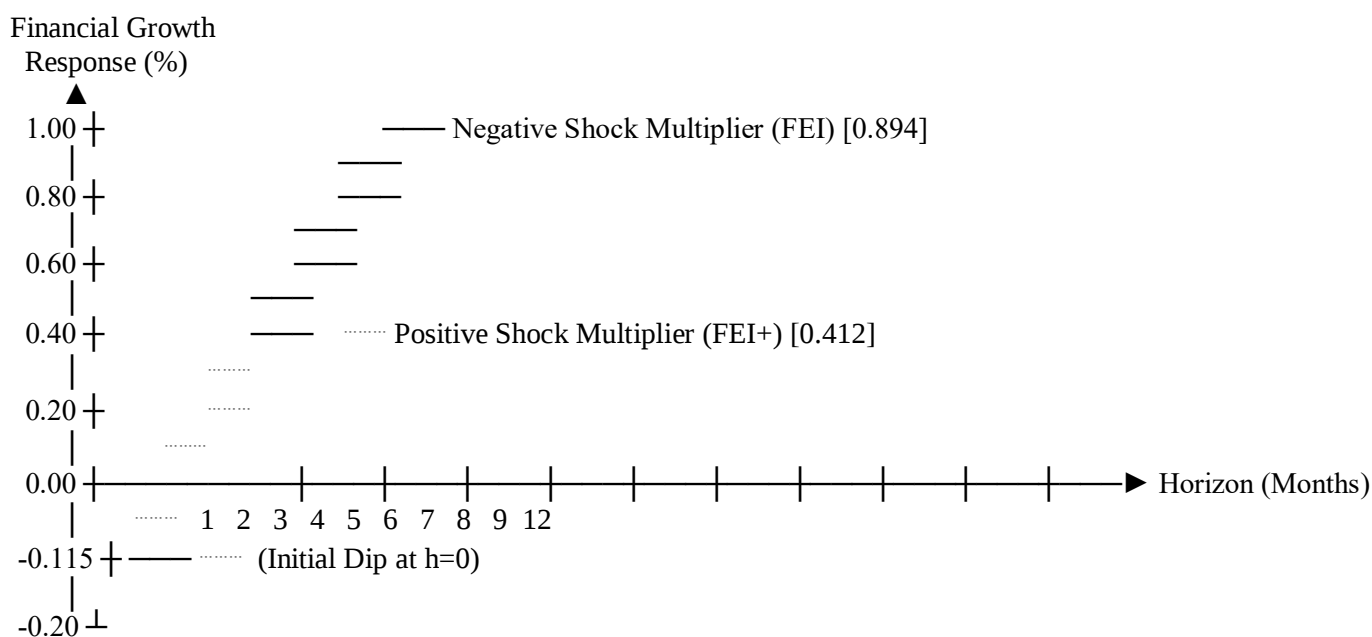


Figure 1

Cumulative Dynamic Multiplier Curves for Positive and Negative Foreign Equity Shocks

4.6 Sectoral Heterogeneity Analysis

An examination of heterogeneity targeting variations in asymmetric dynamics across diverse sectors was conducted to establish market trends. NARDL regressions based on specific sectors were employed to evaluate these variations across three categories of sectors, including Manufacturing & Allied (14 firms), Financial services (11 firms), and Commercial, Services & Technology (15 firms). Table 7 presents a summary of the results of this analysis.

Table 7

Sectoral NARDL Asymmetry Estimations

Sectoral Sample	Sub-Sample	Long-Run Inflows (FEI^+)	Long-Run Outflows (FEI^-)	Adjustment Speed (ECT_{t-1})	Wald Test (χ^2)	Sectoral Asymmetry Outcome
Financial Services		0.524*** (p=0.002)	1.102*** (p=0.000)	-0.412*** (p=0.000)	9.451*** (p=0.002)	High outflow sensitivity
Manufacturing & Allied		0.381** (p=0.038)	0.745*** (p=0.001)	-0.285*** (p=0.004)	5.612** (p=0.018)	Moderate asymmetry
Commercial & Services		0.298* (p=0.082)	0.682*** (p=0.003)	-0.241*** (p=0.011)	4.894** (p=0.027)	Moderate Asymmetry

These sectoral heterogeneity analysis results indicate that the financial sector with FEI^- amounting to 1.102 was more vulnerable to capital flight. The manufacturing (FEI^- =0.745) and commercial (FEI^- =0.682) sectors exhibited some resilience to capital flight, perhaps due to more reliance on internal retained earnings and tangible physical capital which act as buffers to foreign equity portfolio flight.

4.7 Treatment of Endogeneity

The potential for reverse causality between foreign equity flow and firm growth, a major concern for endogeneity was examined using Dynamic Error Correction Representation, Panel System GMM Robustness Validation, and Hansen J-Test of Overidentifying Restrictions. Instrument validity was confirmed by a non-significant Hansen J-test chi-square statistic ($\chi^2 = 12.34$, $p = 0.284$), a verification that the orthogonality condition was satisfied. Meanwhile, The system GMM long-run outflow parameter ($\beta_{\text{GMM}} = 0.821$, $p < 0.001$) was approximately equal to the long-run and short-run NARDL coefficient of 0.894, signifying lack of endogeneity.

4.8 Discussion

This the existence of foreign capital structural asymmetry that exposes firms listed at the Nairobi Securities Exchange (NSE) to sudden shifts in global foreign capital portfolios. Whereas in the long-run foreign capital outflows constitute financial growth shortfalls that are nearly twice the margin of financial growth infused in the firms during foreign capital inflows, subtle short-run localized financial growth frictions occasioned by foreign capital inflow characterize frontier markets like the NSE. Contrary to the conventional restrictive linear models employed in the literature, this paper employs the Nonlinear Autoregressive Distributed Lag (NARDL) model. By so doing, this paper accommodates the deep structural latent variations embedded in the aggregate foreign capital flows.

Specifically, this NARDL model uncovers a long-run disproportion under which the penalty of capital flight (captured by a unit squeeze in capital flight, FEI^- results in a sizable 0.894 unit contraction in growth while the reward of capital expansion (captured by a unit surge in inflows, FEI^+ boosts corporate financial growth by a meager 0.412 units--a ratio that is more than twice as much. This disproportion calls into question the validity of the findings emanating from the linear models previously used in the context of the Kenyan NSE listed firms. For example, whereas Osoro et al. (2020) failed to document a significant long-run effect of foreign equity portfolio flows on security market capitalization, this NARDL model approach undermines the viability of linear models that rest on restrictive symmetric aggregation under which the large, destructive impact of foreign capital outflow simply cancels out the smaller but progressive impact of foreign capital inflows. Contrary to the subtle symmetric VECM framework employed by Ochieng et al. (2019), this NARDL model permits the splitting of directional shocks thus enabling the paper to unveil the structural vulnerability of the NSE.

The strong correspondence of the asymmetric capital flight penalty (approx 2.17:1) unveiled at the NSE aligned with other comparable frontier financial structures across Sub-Saharan Africa, South Asia, and Eastern Europe underscores a common global pattern. In Sub-Saharan African Exchanges, notably the Bourse Régionale des Valeurs Mobilières (BRVM), the Nigerian Exchange (NGX), and the Ghana Stock Exchange (GSE), the disproportionate structural damage inflicted by capital flight compared to the positive impact of inflows resonates closely with prevailing market dynamics in the region (Nyeadi & Adjasi, 2020). Portfolio equity flows into these exchanges are highly sensitive to foreign monetary tightening, global interest rate shocks, and international commodity cycles. During a tightening of global financial conditions, foreign institutional investors exit quickly triggering sudden liquidity contractions. Due to the shallow domestic banking sectors, the resulting funding gap cannot be filled, and listed firms are faced with large balance sheet stress and financing frictions (Jeanne & Sandri, 2023). Likewise, the PSX and the Dhaka Stock Exchange (DSE) in South Asia reveal a similar pattern (Ali & Audi, 2023). Recent empirical literature emphasizes how fast foreign capital inflows into shallow Asian exchanges tend to create short-run distortions in equity valuations and exchange rate imbalances (Delechat et al., 2024). During which time portfolio managers reallocate capital globally, these markets subsequently face severe downward price corrections, increased volatility, and long recovery horizons.

These dynamics find further support in evidence from Central and Eastern European (CEE) Exchanges such as the Bucharest Stock Exchange (BVB) and other smaller Baltic bourses. In smaller European frontier markets, asymmetric capital outflow shocks tend to be exacerbated by sovereign risk revaluations and foreign exchange volatility during global risk-off episodes symmetric spillover between economic policy uncertainty and exchange rate volatility (Wang et al., 2023). Sudden capital retrenchment in these markets destabilizes local asset prices much more severely than equivalent capital inflows prop up local asset prices. Collectively, this cross-regional empirical concurrence reveals that the asymmetric transmission identified at the NSE is not a specific structural idiosyncrasy but rather, reflects a fundamental structural characteristic of frontier stock exchanges globally--the shallow domestic investor base, the limited liquidity depth, and the inherent vulnerability to asymmetric global portfolio rebalancing (Batten et al., 2023; Ochenge et al., 2020).

The aforementioned finding emanating from the NARDL model reinforces the internalization theory under which the integration of foreign capital is not a smooth process but rather, one that is deeply rooted in the strength of the corporate and also the governance of the external macroeconomic profiles. Thus, by documenting the presence of foreign capital structural asymmetry that exposes firms to sudden shifts in global foreign capital portfolios, this paper reveals the structurally vulnerable nature of growth fueled by foreign portfolio equity. Managers of firms and regulators, notably the Capital Markets Authority (CMA) among others, ought to be conscious and vigilant of the possibility of

sudden global reallocation of assets which creates a profound imbalance between the large negative impact of capital outflow and the minor benefit of inflows.

Likewise, this paper also employed the NARDL model to unveil the dynamic friction and asset-bubble realities associated with foreign equity inflows in the short-run, realities which previous models were blind to. For example, this paper confirms that in the short-run immediate foreign equity inflow exerted a negative albeit weak impact on corporate financial growth thus capturing short-run localized financial friction. This short-run localized financial friction finds consistency with the claims of Pamba et al. (2025) who posit that an enormous injection of capital into small frontier markets already liquidity constrained momentarily destabilizes equity pricing and foreign capital structure. Thus, the revelation of potential localized frictions calls into question the suitability of linear VAR models when attempting to map the nexus between foreign capital flow and corporate growth. For example, using the linear VAR model, Ochenge et al. (2020) document a universal promotional impact of foreign inflows on market liquidity and corporate wellness. However, the short-run findings of this paper, unveiled from the asymmetric perspective preclude the possibility of a universal promotional impact thus painting a double-edged sword effect of integrating short-termist friction against long-term structural positivism.

Additionally, this paper also uncovers the existence of asymmetric trajectories capturing various foreign capital flow paths and a highly stable correction mechanism with the potential of correcting market disequilibrium at 32.4% per month. Retrospectively, an external financial shock is corrected in slightly over three months, giving the system enough time to adjust the capital flow to the correct path toward long-run equilibrium. However, the direction of foreign capital volatility determines the actual trajectory and speed of correction since the results capture heavily asymmetric short-run dynamics. The application of the NARDL approach which represents a non-linear model provides a major structural and methodological advancement over the previous linear models (Ochenge et al., 2020; Ochieng et al., 2019; Osoro et al., 2020). While these linear models arbitrarily reallocate adjustment irrespective of the direction assuming the same rate recovery from shocks frontier markets irrespective of positive capital injection or sudden withdrawal, the NARDL asymmetrical model accounts for the directionality of the trajectory and speed of correction. In other words, the asymmetrical model captures the true position of the structural complexities encountered in the Kenyan macro-environment.

The implicit importance of the methodological advancement achieved through the adoption of the NARDL model lies in the unveiling of the disparity between the outflow and recovery trajectories a phenomenon averaged out and hidden by previous symmetric models. While previous models such as the VAR (Ochenge et al., 2020), the VECM (Ochieng et al., 2019), and the linear autoregressive distributed lag (ARDL) used by Osoro et al. (2020) were unable to address the unique constraint of the Pecking Order Theory in a frontier markets setting, the NARDL model used in this paper clearly reveals that persistent capital flight has a negative impact on corporate growth. The abrupt withdrawal of foreign equity forces listed firms to rely on domestic credit which in most cases is insufficient. Consequently, these firms mostly experience the highly frictional process of whittling down their financing pyramids thus accelerating corporate contraction. In contrast, sudden capital inflow results in a short-run localized structural friction in the market thus resulting into a slow, cautious movement toward long-run equilibrium. While in linear models these counter directional forces negate each other, the NARDL model avoids this cancellation effect thus structurally mapping the liquidation and equilibrium trajectories among firms listed at the NSE.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study conducted to capture the asymmetric nature of capital flow underscores the fragile nature of financial growth in frontier markets such as the NSE. Open door policies that have enabled listed firms to own up to 100% of foreign equity have made firms listed at the NSE to gain visibility in global markets, allowing them to attract the attention of global portfolios. However, while attracting global portfolio interest remains a critical avenue for financial growth, it has in contrast directly linked the domestic corporate ecosystem to global macroeconomic shocks. The NSE is quite vulnerable to capital flight because of the highly skewed foreign equity distribution where large institutional firms dominate the foreign segment. Under this environment, sudden flight in capital is not only accompanied by stock price depression, but the whole the entire structure also changes, interest rates are more sensitive, and financial growth across the listed firms gets impeded. This fragile capital flow environment requires transitioning from aggregate capital flow focus to mitigation of the destructive and at times outsized impacts of sudden capital flight.

5.2 Recommendations

The Kenyan government through the CMA should prioritize policies that not only facilitate this transition but which also encourage active engagement of local institutional investors, knowing clearly that financial inclusion that targets domestic players is a vital buffering against volatility of foreign portfolio investment. The CMA should for

instance modernize mandates for institutional investors by instituting risk based capital frameworks instead of the current equity asset class weightings for pension schemes. It can also create a mandatory domestic market making allocation that allows pension funds to deploy 2-5% of assets under management (AUM) into market making pools and securities lending platforms. This would encourage pension assets held for long-term to buffer the exchange should foreign investors make abrupt sell-off decisions.

The policy governing securities lending and borrowing (SLB) & market-making should be revitalized by infusing tax incentives such as exempting short-term capital gains and transfer taxes on SLB transactions in the CMA's 2021 SLB framework. This is likely to widen market depth, allowing local listed firms to execute hedging strategies, and prevent steep price drops during sudden foreign portfolio exits. Moreover, the CMA should look to lower total transaction levies and broker commissions on domestic trades that are highly frequent. This would rationalize these fees and lessen cost friction, enabling domestic asset managers and retail collective investment schemes (CIS) to execute high-volume trading strategies.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding Declaration

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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