Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Too much finance? Nonlinear credit–growth dynamics and threshold evidence from Vietnam

Quoc Luyen Pham

pqluyen@ntt.edu.vn

Nguyen Tat Thanh University

Hong Thuy Khanh Thai

Nguyen Tat Thanh University

Nhut Nghia Huynh

Ho Chi Minh City University of Economics and Finance

Tuan Anh Hoang

Hanoi financial and banking University

My Chi Le

Institute for Research on Career Guidance and International Integration

Research Article

Keywords: Financial development, Economic growth, Threshold effects, Nonlinear dynamics, ARDL, Vietnam

Posted Date: June 11th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9060142/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

This study examines whether financial deepening continues to promote economic growth in a high-credit transition economy or whether diminishing marginal returns emerge once financial depth surpasses a critical threshold. Using quarterly data for Vietnam over the period 2010Q1–2024Q4, the analysis combines linear autoregressive distributed lag (ARDL), nonlinear ARDL (NARDL) and threshold regression models to investigate the dynamic and regime-dependent relationship between private sector credit and economic growth. The results confirm the existence of a stable long-run relationship between credit and growth. However, the baseline linear specification does not reveal a statistically significant marginal growth effect of credit at high levels of financial depth. The nonlinear ARDL model identifies limited short-run asymmetry but no statistically significant long-run divergence between credit expansions and contractions. Most importantly, the threshold analysis identifies a statistically significant cutoff at approximately 123% of GDP. Below this level, credit expansion contributes positively to economic growth, whereas beyond it the marginal growth effect declines substantially and becomes statistically insignificant. These findings provide country-specific evidence supporting the “Too Much Finance” hypothesis and suggest that once financial depth becomes elevated, policy priorities should shift from expanding credit volume toward improving credit allocation efficiency and strengthening macroprudential oversight.

1 Introduction

The relationship between financial development and economic growth remains one of the most debated issues in macroeconomics. Early research emphasized a positive and monotonic link, arguing that financial deepening improves capital allocation and supports long-term growth [1]. However, more recent studies challenge this linear view, suggesting that excessive financial expansion may generate diminishing returns or even hinder growth by encouraging misallocation and financial instability [2, 3].

Recent empirical studies increasingly support a nonlinear interpretation of the finance–growth nexus. Using cross-country data, Arcand et al. [2] estimate that the positive effect of credit on growth diminishes when private credit exceeds approximately 100 per cent of GDP. Cecchetti and Kharroubi [3] further show that excessive credit growth may crowd out more productive sectors, particularly in economies with bank-dominated systems. More recent panel-based and nonlinear studies confirm that the relationship is context-dependent and regime-specific rather than universally monotonic [4, 5]. In emerging and developing economies, the threshold level may differ due to institutional quality, regulatory capacity and financial structure [6, 7].

Despite this growing body of evidence, several gaps remain in the literature. First, most empirical studies rely on annual data, which may obscure short-term credit cycles and macro-financial adjustments. Second, while threshold effects are frequently documented in cross-country panels, country-specific analyses using high-frequency data remain limited. Third, relatively little attention has been paid to

transition and bank-dominated financial systems, where institutional characteristics may alter the finance–growth relationship.

Vietnam provides a compelling empirical setting to revisit these issues. Over the past two decades, Vietnam has experienced rapid financial deepening, with private credit to GDP rising to one of the highest levels among emerging markets. By 2024, the credit-to-GDP ratio exceeded 120 per cent, placing the economy within the range where diminishing marginal returns to finance have been observed in global studies [8]. At the same time, Vietnam's financial system remains predominantly bank-based, with limited development of equity and corporate bond markets. This structural configuration raises an important question: has Vietnam reached a level of financial saturation where additional credit expansion no longer supports sustainable growth?

Existing studies on Vietnam's finance–growth relationship largely employ annual data and linear frameworks, typically finding a positive long-run association between credit and output [9, 10]. However, these approaches may mask nonlinearities and regime shifts that arise at higher levels of financial deepening. Moreover, the use of annual data may fail to capture short-term adjustments and macroprudential interventions implemented by the State Bank of Vietnam, particularly during periods of rapid credit expansion or economic shocks such as the COVID-19 pandemic.

This study revisits the finance–growth nexus in Vietnam by employing quarterly data from 2010Q1 to 2024Q4 and combining linear, nonlinear and regime-specific econometric approaches. Specifically, we estimate (i) a linear autoregressive distributed lag (ARDL) model to identify short- and long-run dynamics; (ii) a nonlinear ARDL (NARDL) model to test for asymmetric effects of credit expansions and contractions; and (iii) Hansen's [11] threshold regression to detect potential structural breakpoints in the credit–growth relationship. By integrating these approaches within a single high-frequency framework, the study provides a more granular assessment of whether and when credit deepening ceases to promote economic growth.

This study contributes to the literature in three ways. First, it provides one of the few quarterly country-level analyses of nonlinear finance–growth dynamics in a transition economy. Second, it integrates linear, asymmetric and threshold approaches within a unified empirical framework, allowing a more comprehensive assessment of regime-dependent effects. Third, the study identifies a statistically significant credit threshold for Vietnam, offering new evidence on the "Too Much Finance" hypothesis in a high-credit emerging market context.

The empirical results suggest that credit expansion generates short-run growth effects, while the long-run marginal contribution of credit becomes weak once financial depth reaches elevated levels.

The remainder of the paper is organized as follows. Section 2 reviews the related literature and positions the study within the nonlinear finance–growth debate. Section 3 describes the data and econometric methodology. Section 4 presents the empirical results. Section 5 discusses the broader theoretical and policy implications. Section 6 concludes.

2 Literature review

2.1 The finance–growth debate: From linear to nonlinear perspectives

The relationship between financial development and economic growth has evolved from a predominantly linear paradigm to a more nuanced nonlinear framework. Early theoretical contributions emphasized the enabling role of finance in mobilizing savings, reducing transaction costs and facilitating efficient capital allocation. In this view, financial deepening promotes investment, innovation and productivity, thereby generating sustained economic growth [1]. Empirical evidence from cross-country regressions during the 1990s and early 2000s largely supported this monotonic interpretation, suggesting that higher levels of private credit relative to GDP were associated with stronger long-run growth performance.

However, the global financial crisis and subsequent episodes of credit-driven instability prompted a reassessment of this linear relationship. Scholars began to question whether continuous financial expansion necessarily translates into proportional growth gains. Arcand et al. [2] provide one of the most influential empirical challenges to the monotonic view, arguing that finance exhibits diminishing marginal returns once private credit exceeds roughly 100 per cent of GDP. Using a broad cross-country panel, they find that excessive financial depth may crowd out productive sectors and amplify macroeconomic vulnerabilities. Similarly, Cecchetti and Kharroubi [3] demonstrate that rapid credit growth can reallocate resources away from high-productivity industries toward less productive or speculative activities, thereby reducing aggregate growth potential.

These findings have led to the formulation of the “Too Much Finance” hypothesis, which posits that the finance–growth relationship follows an inverted-U pattern rather than a strictly positive slope. At low and moderate levels of financial development, credit expansion relaxes liquidity constraints and supports capital formation. Beyond an optimal threshold, however, further deepening may encourage over-leveraging, asset bubbles and misallocation of capital. In this framework, the marginal productivity of finance declines as financial systems expand beyond their institutional absorption capacity.

Subsequent research highlights that the finance–growth relationship depends on institutional and regulatory quality. Law et al. [6] and Sahay et al. [7] show that financial deepening enhances growth only when supported by adequate governance and supervisory capacity. These findings imply that the threshold beyond which finance ceases to promote growth is country-specific and shaped by structural characteristics rather than universal.

In addition, a growing body of work highlights heterogeneity across country groups. In emerging and developing economies, financial systems are often bank-dominated and subject to varying degrees of state intervention. Under such conditions, credit expansion may initially accelerate growth by channeling funds to strategic sectors. Yet as leverage increases, inefficiencies may emerge more rapidly than in diversified financial systems [4]. The nonlinear perspective thus integrates both scale effects and

institutional constraints, recognizing that financial deepening interacts with structural features of the economy.

Methodologically, the shift from linear to nonlinear interpretations has been accompanied by advances in econometric modeling. Traditional linear panel regressions have increasingly been supplemented by threshold regressions, smooth transition models and nonlinear autoregressive distributed lag (NARDL) frameworks. These approaches allow researchers to detect regime shifts, asymmetric effects and structural breakpoints in the finance–growth nexus [5, 11]. By accounting for potential asymmetries between credit expansions and contractions, nonlinear models provide a more realistic depiction of macro-financial dynamics.

Taken together, the literature suggests that the finance–growth relationship is conditional, regime-dependent and potentially nonlinear. While early evidence supported a uniformly positive association, more recent findings indicate that the growth-enhancing effects of finance weaken beyond certain thresholds and may even reverse. This shift in understanding underscores the importance of identifying country-specific tipping points and evaluating whether financial deepening has approached or surpassed its optimal level.

Building on this debate, the present study situates Vietnam within the broader nonlinear finance–growth literature. By employing quarterly data and integrating linear, asymmetric and threshold models, the analysis seeks to determine whether Vietnam's recent trajectory of rapid credit expansion conforms to the inverted-U hypothesis or reflects a different regime-specific pattern characteristic of transition economies.

2.2 Nonlinear and threshold evidence in emerging and developing economies

Building on the nonlinear reinterpretation of the finance–growth nexus, a growing body of empirical research has sought to identify threshold effects and asymmetric dynamics, particularly in emerging and developing economies. These contexts are especially relevant because financial deepening often proceeds rapidly relative to institutional and regulatory capacity, increasing the likelihood of regime-dependent outcomes.

One strand of literature employs threshold regression techniques to estimate critical turning points in the credit–growth relationship. Following the methodological framework proposed by Hansen [11], several studies identify statistically significant breakpoints beyond which the marginal effect of credit on growth declines. Arcand et al. [2] provide early cross-country evidence of such thresholds, while subsequent studies have refined the analysis using regional panels and country-specific samples. For instance, Ntarmah et al. [12] find that in Sub-Saharan Africa, credit contributes positively to growth up to moderate levels, but excessive credit expansion amplifies macroeconomic volatility. Similarly, more recent panel-based studies show that the growth effects of financial development weaken once credit surpasses a country-specific threshold that reflects institutional quality and structural characteristics [4].

Beyond static threshold models, nonlinear autoregressive distributed lag (NARDL) approaches have gained prominence for capturing asymmetric responses of growth to credit expansions and contractions. The NARDL framework introduced by Shin et al. [13] allows the decomposition of positive and negative changes in financial variables, thereby testing whether credit booms and credit slowdowns exert symmetric effects on output. Empirical applications in developing economies reveal that expansions often stimulate growth more strongly than contractions suppress it, suggesting procyclical amplification during upturns and policy smoothing during downturns [5]. Such asymmetries are particularly pronounced in economies with active macroprudential intervention, where authorities may tolerate credit tightening less readily than expansion.

Another related line of research emphasizes regime-specific dynamics in emerging markets. Law et al. [6] demonstrate that financial deepening enhances growth only when institutional quality exceeds a certain threshold, implying a dual-threshold mechanism in which both credit levels and governance standards jointly determine outcomes. In the absence of strong regulatory oversight, rapid credit growth may lead to resource misallocation, particularly toward real estate or non-tradable sectors, thereby reducing aggregate productivity. This pattern has been documented in several middle-income economies where credit booms preceded periods of financial stress [3].

Emerging and transition economies often exhibit structural characteristics—such as bank dominance and state-influenced credit allocation—that may amplify nonlinear effects. In such systems, rapid credit expansion can outpace institutional development, potentially accelerating the emergence of diminishing returns. Empirical studies increasingly recognize that financial depth alone does not guarantee growth; rather, the composition, efficiency and governance of credit flows play decisive roles [7].

Despite this expanding literature, two notable gaps persist. First, much of the evidence relies on annual panel datasets, which may obscure short-term credit cycles and rapid regime shifts characteristic of emerging markets. Quarterly analyses remain comparatively scarce, even though high-frequency data can better capture the timing and persistence of nonlinear effects. Second, while threshold levels are frequently estimated in cross-country frameworks, country-specific applications that integrate both asymmetric dynamics and regime-switching mechanisms within a unified model are limited. Such integrated approaches are particularly valuable in high-credit emerging economies where the finance–growth relationship may evolve quickly in response to policy adjustments and external shocks.

Taken together, the literature suggests that the finance–growth nexus is nonlinear, threshold-dependent and conditioned by institutional structure. However, two important gaps remain. First, most existing studies rely on annual panel datasets, which may obscure short-term credit cycles and macro-financial adjustments. Second, relatively few studies combine asymmetric dynamics and threshold estimation within a unified framework using high-frequency country-level data. Addressing these gaps is particularly relevant for transition and bank-dominated economies where rapid financial deepening may generate regime shifts. This study responds to this need by integrating ARDL, NARDL and threshold models using quarterly data for Vietnam.

2.3 Finance–growth dynamics in transition and bank-dominated systems

While the nonlinear finance–growth literature has expanded significantly, relatively less attention has been devoted to transition economies and bank-dominated financial systems, where structural characteristics may fundamentally alter the transmission of credit to real activity. In such economies, rapid financial deepening often coincides with institutional transformation, regulatory upgrading and gradual capital market development. These structural features imply that the marginal impact of credit may differ from patterns observed in advanced or diversified financial systems.

Transition economies typically rely heavily on banking intermediaries as the primary channel of financial intermediation. Capital markets are often shallow, corporate bond markets underdeveloped and equity financing limited. As a result, bank credit becomes the dominant source of external finance for firms and households. In the early stages of transition, credit expansion may alleviate severe financing constraints inherited from centrally planned systems, thereby stimulating investment and growth. However, as leverage increases, structural inefficiencies—such as soft budget constraints, state-directed lending and weak risk assessment—may reduce the productivity of additional credit.

Empirical evidence suggests that the finance–growth relationship in bank-dominated systems is more susceptible to diminishing returns at high levels of financial depth. Cecchetti and Kharroubi [3] argue that in economies where banks allocate credit disproportionately to non-tradable or speculative sectors, excessive financial expansion can crowd out productivity-enhancing investment. Similarly, Sahay et al. [7] emphasize that financial deepening without parallel improvements in regulatory and supervisory capacity may increase systemic risk and reduce long-run growth stability. These dynamics are particularly relevant in transition contexts, where financial liberalization often precedes full institutional consolidation.

Recent research also highlights the role of state involvement in shaping credit allocation. In several emerging and transition economies, government influence over banking systems may support targeted industrial policies or macroeconomic stabilization objectives. While such interventions can mitigate short-term downturns, they may also distort risk pricing and reduce allocative efficiency over time. As a consequence, credit may generate stronger short-run effects than long-run gains, reinforcing cyclical volatility rather than structural productivity improvements.

In the specific case of Vietnam, existing studies largely rely on annual data and linear estimation strategies, typically identifying a positive association between banking sector development and economic growth [9, 10]. While these findings confirm the importance of credit during periods of rapid industrialization, they do not address whether the relationship remains stable as financial depth approaches historically high levels. Moreover, annual data may obscure short-term fluctuations associated with credit ceilings, macroprudential adjustments and external shocks.

Vietnam's financial structure exhibits many of the characteristics associated with transition and bank-dominated systems. The banking sector remains the principal intermediary, while equity and corporate bond markets, although expanding, play a secondary role. Credit allocation has historically been influenced by policy priorities, including support for state-owned enterprises and strategic sectors. As private credit to GDP has risen above levels commonly identified as threshold ranges in global studies, an important question emerges: does continued financial expansion sustain growth, or has the system reached a saturation point where marginal returns decline?

Despite the relevance of this question, there is limited high-frequency evidence examining regime-dependent effects in transition economies. Most cross-country analyses aggregate heterogeneous institutional environments, potentially masking country-specific dynamics. Furthermore, few studies integrate asymmetric short-run analysis with structural threshold identification within a single empirical framework. For transition and bank-dominated systems, such integration is essential to distinguish between temporary credit stimulus and structural saturation effects.

In this context, examining Vietnam through a nonlinear and threshold-based approach offers broader implications for similar economies undergoing financial deepening amid institutional transformation. By employing quarterly data and combining ARDL, NARDL and threshold regression models, the present study provides a more refined assessment of whether the finance–growth relationship in a bank-dominated transition economy follows the inverted-U hypothesis or exhibits a distinct regime-specific pattern shaped by structural features.

Taken together, the literature indicates that the finance–growth nexus is nonlinear, threshold-dependent and conditioned by institutional structure. However, high-frequency country-specific evidence in transition and bank-dominated systems remains limited. By integrating ARDL, NARDL and threshold approaches using quarterly data for Vietnam, this study addresses this gap and tests whether rapid credit expansion reflects continued financial deepening or signals regime saturation.

3 Methodology

3.1 Data and variable construction

This study employs quarterly data for Vietnam covering the period from 2010Q1 to 2024Q4. The use of quarterly frequency allows for a more precise identification of short-run credit dynamics and potential regime shifts that may be obscured in annual datasets. The sample period captures episodes of rapid credit expansion, macroprudential adjustments and the COVID-19 shock, thereby providing sufficient variation to test nonlinear and threshold effects.

Data are collected from multiple official and international sources. Real gross domestic product (GDP) is obtained from the General Statistics Office of Vietnam. Banking sector indicators, including outstanding credit to the private sector, are sourced from the State Bank of Vietnam. Macroeconomic control variables—such as inflation, exchange rate and short-term interest rates—are retrieved from the

International Monetary Fund's International Financial Statistics and cross-checked with the World Bank's World Development Indicators to ensure consistency.

Dependent variable. Economic growth (denoted as GROWTH) is constructed as the logarithm of one plus the year-on-year real GDP growth rate. This transformation ensures that negative growth observations—particularly during the COVID-19 period—are retained while stabilizing variance and preserving elasticity interpretation. The log-one-plus transformation is commonly used in macro-financial studies to address distributional asymmetry without losing economic interpretability.

Key explanatory variable. The main explanatory variable is domestic credit to the private sector as a percentage of GDP (denoted as CREDIT). This measure captures the depth of financial intermediation and is widely used in the finance–growth literature [2, 3]. The quarterly credit-to-GDP ratio is calculated using nominal outstanding credit divided by nominal GDP. Unlike annual smoothing approaches, the raw quarterly ratio is retained to preserve cyclical fluctuations relevant for identifying asymmetric and threshold dynamics.

Given the study's focus on nonlinear effects, the logarithm of the credit ratio is employed in estimation to mitigate scale effects and facilitate elasticity interpretation. For the nonlinear ARDL specification, first differences of the logged credit variable are decomposed into positive and negative partial sums to capture asymmetric responses.

Control variables. To isolate the independent contribution of credit, several macroeconomic controls are included. Inflation (INF) is measured as the year-on-year percentage change in the consumer price index, capturing macroeconomic stability conditions. The nominal exchange rate (EXCH), expressed as Vietnamese dong per US dollar, accounts for external competitiveness and capital flow pressures. The short-term policy interest rate (INT), proxied by the refinancing rate set by the State Bank of Vietnam, reflects the stance of monetary policy.

All control variables are transformed into logarithmic form where appropriate to reduce heteroskedasticity and allow for semi-elasticity interpretation. These controls are standard in macro-financial growth regressions and help mitigate omitted variable bias arising from monetary and external conditions.

Data treatment and preliminary considerations. Missing observations are minimal and confined to isolated quarters during the pandemic; these are handled using linear interpolation, with robustness checks confirming that alternative treatments do not alter the main results. No seasonal adjustment is applied to preserve raw economic fluctuations, as the objective is to detect potential threshold and regime-specific effects rather than long-term trend relationships.

Prior to model estimation, unit root tests are conducted to determine the integration order of each variable and verify compatibility with the autoregressive distributed lag framework [14]. The mixed

integration properties observed in macroeconomic series further justify the use of ARDL-based methodologies.

In summary, the dataset combines high-frequency macroeconomic and financial indicators to enable a comprehensive assessment of linear, asymmetric and regime-dependent credit–growth dynamics in a high-credit emerging economy. The next subsection outlines the econometric framework employed to identify these relationships.

3.2 Econometric framework

To examine whether financial deepening continues to promote growth or exhibits diminishing and potentially adverse effects at high levels of credit, this study adopts a three-step empirical strategy. Specifically, we estimate (i) a baseline linear autoregressive distributed lag (ARDL) model, (ii) a nonlinear ARDL (NARDL) specification to capture asymmetry, and (iii) a threshold regression to identify regime-dependent effects.

Baseline ARDL specification. The long-run finance–growth relationship is first estimated using the following ARDL(p, q) model:

$$GROWTH_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i GROWTH_{t-i} + \sum_{j=0}^{q} \beta_j CREDIT_{t-j} \sum_{k=0}^{m} \gamma_k X_{t-k} + \epsilon_t$$

1

where $GROWTH_t$ denotes real economic growth, $CREDIT_t$ is private sector credit-to-GDP, and X_t represents the vector of control variables (inflation, exchange rate, and interest rate). The lag orders p and q are selected using the Akaike Information Criterion.

The ARDL framework is appropriate for three reasons. First, it accommodates regressors with mixed integration orders I(0) and I(1), provided none are I(2). Second, it performs well in relatively small samples. Third, it enables the simultaneous estimation of short-run dynamics and long-run equilibrium relationships via an error-correction representation.

The associated error-correction form can be written as:

$$\Delta GROWTH_t = \varnothing \left(GROWTH_{t-1} - \theta_1 CREDIT_{t-1} - \theta_2 X_{t-1} \right) + \sum \delta_i \Delta Z_{t-i} + u_t$$

2

where ϕ is the speed of adjustment parameter. A statistically significant and negative ϕ confirms long-run cointegration.

Economically, the linear ARDL model tests whether financial deepening exerts a uniform marginal effect on growth across different credit levels. However, this assumption may be restrictive if excessive credit

generates distortions or resource misallocation.

Nonlinear ARDL (NARDL). To allow for asymmetric effects of credit expansion and contraction, we follow Shin et al. [13] and decompose credit into positive and negative partial sums:

$$CREDIT_t^+ = \sum_{j=1}^{t} max\left(\Delta CREDIT_j, 0\right)$$

$$CREDIT_t^- = \sum_{j=1}^{t} min\left(\Delta CREDIT_j, 0\right)$$

The nonlinear specification becomes:

$$GROWTH_t = \alpha + \beta^+ CREDIT_t^+ + \beta^- CREDIT_t^- + \gamma X_t + \epsilon_t$$

3

This formulation permits expansionary and contractionary credit movements to exert different long-run effects.

From an economic perspective, credit booms may initially stimulate growth through investment and consumption channels, whereas credit contractions may exert disproportionately large negative effects due to balance sheet constraints and financial fragility. Testing whether $\beta^+ \neq \beta^-$ provides evidence of such asymmetry.

Threshold regression. While NARDL captures short-run asymmetry, it does not identify whether the level of credit itself alters the growth effect. To test for a credit saturation point, we estimate a threshold model of the form:

$$GROWTH_t = \begin{cases} \beta_1 CREDIT_t + \gamma_1 X_t + \epsilon_t, if CREDIT_t \leq \tau \\ \beta_2 CREDIT_t + \gamma_2 X_t + \epsilon_t, if CREDIT_t > \tau \end{cases}$$

4

where τ denotes the endogenously determined threshold value.

The threshold parameter is estimated using a grid-search procedure that minimizes the sum of squared residuals, following Hansen [11]. Statistical significance is assessed via bootstrap methods.

Economically, this model directly evaluates the “Too Much Finance” hypothesis. If $\beta_1 > 0$ and $\beta_2 \leq 0$, financial development enhances growth up to a certain point but becomes neutral or harmful beyond the threshold. Even if β_2 remains positive but significantly smaller than β_1, this would indicate diminishing marginal returns to credit expansion.

Identification logic. The empirical strategy proceeds sequentially. The linear ARDL establishes the average finance–growth relationship. The NARDL specification tests whether credit expansions and contractions have asymmetric effects. Finally, the threshold model determines whether the marginal effect of credit changes once a critical level of financial depth is reached.

Together, these approaches provide complementary evidence on whether Vietnam's rapid credit expansion reflects productive financial deepening or signals the emergence of a saturation regime.

3.3 Estimation strategy and diagnostic tests

Estimation sequence. The empirical analysis proceeds in three sequential stages to ensure methodological coherence and robust inference.

First, we estimate the baseline ARDL model to examine the existence of a long-run equilibrium relationship between credit and economic growth. The optimal lag structure is selected using the Akaike Information Criterion (AIC), given its superior performance in relatively small samples. The bounds testing procedure of Pesaran et al. [14] is employed to test for cointegration. If the computed F-statistic exceeds the upper critical bound, a stable long-run relationship is confirmed.

Second, conditional on cointegration, we estimate the associated error-correction representation to distinguish between short-run dynamics and long-run effects. The magnitude and statistical significance of the error-correction term (ECT) indicate the speed at which deviations from long-run equilibrium are corrected. A negative and statistically significant ECT supports the stability of the system.

Third, we estimate the nonlinear ARDL (NARDL) model to assess whether positive and negative changes in credit exert asymmetric effects. Wald tests are conducted to evaluate both short-run and long-run asymmetry. Rejecting the null hypothesis of symmetry (i.e., $\beta^{+} = \beta^{-}$) would indicate that credit expansions and contractions affect growth differently.

Finally, the threshold regression model is estimated to identify potential regime shifts associated with excessive credit levels. The threshold value is determined endogenously via a grid-search procedure that minimizes the sum of squared residuals within a trimmed sample. Statistical inference for the threshold parameter is obtained using bootstrap methods, which account for the non-standard distribution of the threshold estimator.

This sequential approach ensures that nonlinearity is tested only after establishing the existence of a stable long-run relationship.

Diagnostic tests. To ensure the reliability of the empirical findings, a comprehensive set of diagnostic tests is performed.

Unit root tests. Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests are conducted to determine the order of integration of each variable. The ARDL framework requires that none of the series

be integrated of order two, I(2). The mixed integration properties typically observed in macroeconomic time series further justify the use of ARDL methodology.

Serial correlation. The Breusch–Godfrey LM test is employed to detect residual autocorrelation. Absence of serial correlation ensures consistent and efficient parameter estimates.

Heteroskedasticity. The Breusch–Pagan and White tests are used to examine whether residual variance is constant. Where necessary, heteroskedasticity-consistent standard errors are applied.

Functional form specification. The Ramsey RESET test is conducted to assess model misspecification. A failure to reject the null hypothesis indicates that the model is correctly specified.

Stability tests. The cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests are applied to evaluate parameter stability over time. These tests are particularly important given the structural changes associated with rapid credit expansion and the COVID-19 shock.

Robustness checks. Several robustness checks are implemented to verify the stability of the results. First, alternative lag specifications are estimated to ensure that findings are not sensitive to model selection criteria. Second, we re-estimate the models excluding the pandemic period to examine whether the results are driven by extreme observations. Third, alternative transformations of the credit variable (e.g., growth rate instead of ratio) are considered to confirm that the identified threshold effects are not an artifact of scaling.

Together, these diagnostic and robustness procedures enhance confidence that any detected nonlinear or threshold effects reflect genuine structural features of the finance–growth relationship rather than econometric misspecification.

4 Findings

4.1 Preliminary analysis and cointegration results

Descriptive statistics and correlation patterns. Table 1 presents the descriptive statistics of the variables over the period 2010Q1–2024Q4. Real economic growth, expressed as ln(1 + GDP growth), exhibits moderate variability, with a mean of approximately 0.057 and a standard deviation of 0.022. This suggests relatively stable quarterly growth dynamics despite episodes of macroeconomic stress.

Credit to the private sector (log level) shows a steady upward trajectory with limited dispersion, reflecting sustained financial deepening over the sample period. Inflation and interest rates display higher volatility relative to growth and credit, consistent with the pro-cyclical nature of monetary conditions.

Table 1
Descriptive statistics (2010Q1–2024Q4)

Variable	Obs	Mean	Std. Dev.	Min	Max
GROWTH (ln_gdpg)	60	0.0566	0.0221	-0.0621	0.1285
CREDIT (ln_credit)	60	6.1261	0.1914	5.7003	6.5448
EXCH (ln_exch)	60	10.0005	0.0677	9.8115	10.0962
INF (ln_inf)	60	1.2859	0.8717	-1.2301	3.1150
INT (ln_int)	60	1.8528	0.3358	1.3863	2.6391

Notes: *Variables are in logarithmic form where applicable. GROWTH denotes ln(1 + real GDP growth rate). CREDIT represents log private sector credit-to-GDP. INF, EXCH and INT denote inflation, exchange rate and interest rate, respectively. The sample consists of quarterly observations from 2010Q1 to 2024Q4.*

Source: *Authors' calculations.*

The pairwise correlations reported in Table 2 indicate that credit and growth are weakly correlated in levels, while macroeconomic variables show moderate interrelationships. Importantly, no correlation exceeds conventional multicollinearity concern thresholds, suggesting that subsequent regression estimates are unlikely to be driven by linear dependence among regressors.

Table 2
Pairwise correlation matrix

Variable	GROWTH	CREDIT	EXCH	INF	INT
GROWTH	1.0000				
CREDIT	-0.1615	1.0000			
EXCH	-0.0508	0.4522	1.0000		
INF	-0.0078	-0.2153	-0.4782	1.0000	
INT	0.0559	-0.4157	-0.7287	0.6385	1.0000

Notes: *Correlations are computed using quarterly observations. Values above 0.8 in absolute terms typically indicate potential multicollinearity concerns.*

Source: *Authors' calculations.*

Stationarity analysis. Before estimating the ARDL framework, unit root tests are conducted to determine the integration order of each variable. Table 3 reports the results of both Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests in levels and first differences.

The evidence suggests mixed integration properties. While some series appear non-stationary in levels under the ADF test, first differences are consistently stationary. The PP test provides additional support

for stationarity in certain level variables. Crucially, no variable is found to be integrated of order two.

This mixed I(0)/I(1) structure satisfies the preconditions for the ARDL bounds testing procedure.

Table 3
Unit root test results (ADF and Phillips–Perron)

Variable	ADF Level (t-stat)	p-value	PP Level (t-stat)	p-value	ADF First Diff. (t-stat)	p-value	Order of Integration
GROWTH	-2.304	0.432	-5.808	0.000	-5.712	0.000	I(0)/I(1)*
CREDIT	-2.123	0.533	-6.324	0.000	-3.862	0.002	I(1)
EXCH	-2.904	0.161	-3.375	0.012	-8.377	0.000	I(1)
INF	-2.194	0.493	-2.500	0.115	-4.389	0.000	I(1)
INT	-3.514	0.038	-1.226	0.662	-4.737	0.000	I(0)/I(1)**
Notes:							

- *The null hypothesis for both ADF and PP tests is the presence of a unit root.*
- *Lag length = 4 (quarterly data).*
- **GROWTH appears stationary under PP but not consistently under ADF at levels.*
- ***INT appears stationary under ADF at the 5% level but not under PP.*
- *None of the variables are integrated of order two, I(2).*

Source: *Authors' calculations.*

Bounds test for cointegration. To examine whether a stable long-run relationship exists between credit and economic growth, we apply the Pesaran, Shin and Smith (2001) bounds testing procedure within the ARDL framework.

Table 4 reports the computed F-statistics for both the linear and nonlinear specifications. For the baseline ARDL model, the F-statistic exceeds the upper critical bound at conventional levels, allowing rejection of the null hypothesis of no level relationship. The associated t-statistic on the lagged dependent variable is negative and statistically significant, further confirming cointegration.

In the nonlinear ARDL model, the F-statistic is even larger and clearly exceeds the upper bound, indicating stronger evidence of a long-run equilibrium relationship when asymmetry is allowed.

These findings confirm that credit and growth are cointegrated, legitimizing the estimation of error-correction representations in the subsequent analysis.

Table 4
ARDL bounds test for cointegration

Model Specification	F-statistic	t-statistic (ECT)	Decision (5% level)
Linear ARDL	4.833	-4.022	Cointegration confirmed*
Nonlinear ARDL	6.084	-4.807	Cointegration confirmed**

Critical Values (Finite sample, Case III: unrestricted intercept, no trend)

Significance Level	Lower Bound I(0)	Upper Bound I(1)
10%	2.567	3.743
5%	3.073	4.375
1%	4.232	5.803
Notes:		

- *The null hypothesis is no long-run relationship.*
- *Cointegration is confirmed when the F-statistic exceeds the upper bound critical value.*
- *The nonlinear ARDL model shows stronger evidence of cointegration.*
- *Finite-sample critical values follow Kripfganz and Schneider (2020).*
- *ECT denotes the coefficient on the lagged error-correction term.*
- ** Linear ARDL rejects the null hypothesis of no cointegration at the 5% level.*
- *** Nonlinear ARDL clearly rejects the null at the 5% level.*

Source: *Authors' calculations.*

Stability diagnostics. Given the rapid credit expansion observed during the sample period, it is important to assess whether model parameters remain stable over time. Figures 1 and 2 display the CUSUM and CUSUMSQ statistics derived from the baseline ARDL model.

Both statistics remain within the 5% confidence boundaries throughout the sample, suggesting parameter constancy and absence of major structural instability. This is particularly noteworthy considering the presence of the COVID-19 shock and periods of monetary tightening.

The preliminary analysis establishes three important conditions for the subsequent empirical investigation. First, the variables exhibit mixed integration orders consistent with ARDL applicability. Second, bounds testing confirms a stable long-run relationship between credit and growth. Third, diagnostic tests indicate parameter stability over the sample period.

Having established cointegration and model validity, the next subsection examines the magnitude and economic interpretation of the baseline linear ARDL results.

4.2 Baseline linear ARDL results

Having established cointegration between credit and economic growth, we now turn to the baseline linear ARDL estimates to evaluate the average marginal effect of financial deepening.

Long-run relationship. Table 5 reports the long-run coefficients derived from the ARDL(1,0,0,3,0) specification. The estimated coefficient on private sector credit is negative but statistically insignificant. This finding suggests that, once macroeconomic controls are accounted for, additional credit expansion does not exert a statistically robust growth-enhancing effect over the long run.

Table 5
Baseline ARDL long-run and short-run estimates **Panel A. Long-run coefficients**

Variable	Coefficient	Std. Error	t-stat	p-value
CREDIT	-0.0425	0.0317	-1.34	0.186
EXCH	0.0317	0.1883	0.17	0.867
INF	-0.0022	0.0087	-0.25	0.804
INT	-0.0072	0.0337	-0.21	0.831

Panel B. Short-run dynamics

Variable	Coefficient	Std. Error	t-stat	p-value
ΔINF(t − 1)	-0.0158	0.0055	-2.89	0.006
ΔINF(t − 2)	0.0147	0.0057	2.58	0.013
(Only statistically relevant short-run coefficients reported.)				
Panel C. Error-correction term				

Variable	Coefficient	Std. Error	t-stat	p-value
ECT(-1)	-0.5652	0.1405	-4.02	0.000

Model diagnostics

- Observations: 56
- R^2: 0.582
- Adjusted R^2: 0.511
- Bounds F-statistic: 4.833

- Serial correlation (LM test): Not detected

Notes:

- *The dependent variable is ΔGROWTH.*
- *CREDIT denotes log private sector credit-to-GDP.*
- *ECT represents the lagged error-correction term.*
- *Lag selection based on AIC.*
- *Robust inference is recommended due to evidence of heteroskedasticity.*

Source: *Authors' calculations.*

From an economic perspective, this result is noteworthy. Vietnam has experienced sustained financial deepening during the sample period, with credit-to-GDP reaching historically high levels. The absence of a significant positive long-run elasticity implies that the marginal contribution of additional credit may have diminished. In other words, the linear specification does not support the view that financial deepening uniformly stimulates growth at higher levels of credit intensity.

Among the control variables, inflation and interest rates do not exhibit significant long-run effects in the baseline model, while exchange rate movements show weak and unstable influence. These results reinforce the possibility that the finance–growth linkage may not be adequately captured by a purely linear framework.

Short-run dynamics and adjustment speed. The error-correction term (ECT) is negative and highly statistically significant, with a magnitude of approximately − 0.56. This implies that around 56% of deviations from long-run equilibrium are corrected within one quarter. Such a relatively fast speed of adjustment suggests that the credit–growth system is dynamically stable and responsive to short-term shocks.

In the short run, lagged inflation terms display significant dynamic effects, indicating that price-level fluctuations exert immediate influence on output growth. By contrast, short-run changes in credit do not show a consistent or statistically strong impact on growth within the linear framework.

This divergence between a stable long-run equilibrium and weak short-run credit effects further motivates the need to explore nonlinear and regime-dependent dynamics.

Economic interpretation. Taken together, the baseline ARDL results provide limited support for a strong linear finance–growth relationship in Vietnam over the period studied. While cointegration confirms the existence of a stable long-run association, the absence of a statistically significant positive long-run coefficient on credit suggests that financial deepening may have reached a stage where additional expansion yields diminishing marginal returns.

However, the linear specification imposes the restriction that the marginal effect of credit is constant across all levels. If the true relationship follows an inverted-U pattern or exhibits asymmetric responses to credit expansions and contractions, the linear ARDL model may obscure such nonlinearities.

Accordingly, the next subsection introduces a nonlinear ARDL (NARDL) specification to assess whether positive and negative credit shocks affect growth asymmetrically.

4.3 Asymmetric effects: NARDL findings

To examine whether credit expansions and contractions exert asymmetric effects on economic growth, we estimate the nonlinear ARDL (NARDL) specification described in Section 3.2. This approach decomposes changes in credit into positive and negative partial sums, allowing growth responses to differ across credit cycles.

Cointegration and dynamic stability. The bounds test for the nonlinear model yields a significantly larger F-statistic than in the linear specification, clearly exceeding the upper critical bound at conventional levels. This confirms the presence of a stable long-run equilibrium relationship when asymmetry is allowed.

The estimated error-correction term is negative and highly significant, with a magnitude exceeding that observed in the linear ARDL model. This implies a faster speed of adjustment toward long-run equilibrium under the asymmetric specification, suggesting that allowing for credit asymmetry improves the model's dynamic fit. The magnitude greater than unity may reflect overshooting dynamics typical in small-sample nonlinear ARDL specifications and does not violate model stability conditions [13].

Long-run asymmetric effects. Table 6 reports the long-run coefficients associated with positive and negative credit movements. Neither the cumulative positive credit component nor the cumulative negative component is statistically significant in the long run. Moreover, a joint Wald test fails to reject the null hypothesis that the long-run effects of credit expansions and contractions are equal.

Table 6
Nonlinear ARDL (NARDL) long-run and short-run estimates **Panel A. Long-run asymmetric effects**

Variable	Coefficient	Std. Error	t-stat	p-value
$CREDIT^{+}$ (positive)	0.0060	0.0539	0.11	0.912
$CREDIT^{-}$ (negative)	0.0305	0.0604	0.50	0.617
INF	0.0061	0.0051	1.18	0.246
EXCH	0.5564	0.2648	2.10	0.044
INT	-0.0457	0.0303	-1.51	0.143

Panel B. Short-run asymmetric dynamics (selected significant coefficients)

Variable	Coefficient	Std. Error	t-stat	p-value
$\Delta CREDIT^{-}(t-1)$	-0.1844	0.0725	-2.54	0.017
$\Delta CREDIT^{-}(t-3)$	0.2433	0.0693	3.51	0.001
$\Delta INF(t-1)$	-0.0194	0.0068	-2.85	0.008
$\Delta INT(t-3)$	0.1361	0.0391	3.48	0.002
(Only statistically significant short-run coefficients are reported.)				
Panel C. Error-correction term				

Variable	Coefficient	Std. Error	t-stat	p-value
ECT(-1)	-1.4306	0.2976	-4.81	0.000

Panel D. Wald test for long-run symmetry

Hypothesis	F-statistic	p-value	Conclusion
$CREDIT^{+} = CREDIT^{-}$	2.38	0.1099	Fail to reject symmetry

Model statistics

- Observations: 56
- R^2: 0.814
- Adjusted R^2: 0.647
- Bounds F-statistic: 6.084 (cointegration confirmed at 5%)

Source: *Authors' calculations.*

These findings indicate that, over the long horizon, the Vietnamese economy does not exhibit statistically significant asymmetry in the growth impact of credit increases versus decreases. In other words, sustained credit expansions do not appear to generate stronger long-run growth effects relative to contractions, nor do contractions exhibit persistently stronger negative consequences.

This result weakens the argument that prolonged credit booms systematically fuel long-run growth in the current stage of financial development.

Short-run asymmetry. While long-run asymmetry is not statistically supported, short-run dynamics reveal more nuanced patterns. Lagged negative credit shocks display statistically significant effects in certain periods, suggesting that contractions in credit may temporarily influence output growth more strongly than expansions.

This pattern is consistent with balance-sheet and financial accelerator mechanisms, whereby tightening credit conditions can propagate rapidly through investment and consumption channels. However, these effects do not persist in the long run.

The short-run evidence therefore suggests temporary asymmetry but not structural regime divergence.

Interpretation. The nonlinear ARDL results provide two important insights.

First, allowing for asymmetry strengthens evidence of cointegration and improves dynamic stability, implying that credit–growth interactions are indeed state-dependent in the short run.

Second, the absence of statistically significant long-run asymmetry indicates that credit expansions and contractions do not generate systematically different growth trajectories over extended horizons.

Taken together, the NARDL findings suggest that nonlinearities may exist primarily in short-run adjustments rather than in permanent structural effects. However, the NARDL framework does not explicitly identify whether the level of credit itself alters the marginal growth effect.

To directly evaluate whether Vietnam has entered a high-credit regime consistent with the “Too Much Finance” hypothesis, we next estimate a threshold regression model.

4.4 Threshold estimation and regime analysis

While the linear and nonlinear ARDL models examine average and asymmetric responses of growth to credit changes, they do not explicitly determine whether the *level* of credit alters its marginal impact on economic performance. To directly test the “Too Much Finance” hypothesis, we estimate a threshold regression model in which the effect of credit on growth depends on whether credit exceeds an endogenously determined cutoff level.

Estimated threshold and regime classification. Using a grid-search procedure following [11], the bootstrap test with 1,000 replications identifies a statistically significant threshold at ln_credit = 6.11, corresponding to approximately 123% of GDP. The likelihood ratio (LR) statistic equals 18.74, exceeding the 5% bootstrap critical value of 12.31. The bootstrap p-value is 0.028, confirming statistical significance. The 95% confidence interval for the threshold is [6.03, 6.18], indicating a relatively tight regime boundary.

The threshold is statistically significant based on bootstrap inference, indicating that the marginal effect of credit differs across regimes.

Regime-specific coefficients. Table 7 reports the regime-specific estimates.

In the low-credit regime, the coefficient on credit is positive and statistically significant, suggesting that financial deepening enhances economic growth when credit remains below the threshold. This finding is consistent with traditional finance–growth theory, whereby improved intermediation alleviates liquidity constraints and supports capital accumulation.

In contrast, in the high-credit regime, the coefficient on credit becomes substantially smaller and statistically insignificant. In some specifications, it may even turn negative. This pattern indicates diminishing marginal returns to credit once financial depth surpasses the estimated threshold.

Importantly, while the high-credit coefficient is not strongly negative in all cases, its magnitude is significantly weaker than in the low-credit regime. This implies that additional credit expansion in an already deep financial system does not translate into proportionate growth gains.

Table 7
Threshold regression results **Panel A. Threshold estimation statistics**

Statistic	Value
Estimated threshold (τ)	6.11
Equivalent credit-to-GDP	≈ 123%
LR statistic	18.74
Bootstrap p-value	0.028
95% confidence interval	[6.03, 6.18]
Bootstrap replications	1,000

Panel B. Regime-specific credit effects

Regime	Condition	Credit coefficient	Std. Error	t-stat	p-value
Regime 1 (Low-credit)	ln_credit ≤ 6.11	0.0824	0.0315	2.62	0.012
Regime 2 (High-credit)	ln_credit > 6.11	0.0147	0.0278	0.53	0.600

Panel C. Sample distribution across regimes

Regime	Observations	Percentage of sample
Low-credit regime	31	55%
High-credit regime	25	45%
Notes:		

- *The threshold is estimated using* [11] *grid-search procedure.*
- *Statistical significance is assessed using 1,000 bootstrap replications.*
- *The dependent variable is real economic growth.*
- *Control variables are included but not reported for brevity.*
- *Coefficients represent marginal effects of credit within each regime.*

Source: *Authors' calculations.*

Economic interpretation. The threshold results provide more direct evidence regarding the saturation hypothesis than the ARDL and NARDL models.

First, the positive effect of credit in the low-credit regime confirms that financial deepening played a constructive role during earlier stages of Vietnam's development.

Second, the attenuation—or disappearance—of the credit effect beyond the threshold suggests that the economy may have entered a stage of financial saturation. At high levels of leverage, additional credit may be increasingly allocated toward less productive sectors, including real estate or short-term speculative activities, rather than productivity-enhancing investment.

These findings align with the broader nonlinear finance–growth literature, which argues that excessive financial expansion can weaken growth performance once institutional and allocative efficiency constraints bind.

Policy implications of regime shifts. The existence of a statistically significant threshold implies that financial policy should not focus solely on promoting credit expansion, but rather on improving the quality and allocation efficiency of credit flows. Once financial depth surpasses the estimated cutoff, further quantitative expansion may generate limited growth benefits and potentially increase macro-financial vulnerability.

Thus, rather than advocating continued rapid credit growth, the evidence supports a transition toward prudential regulation, capital market diversification and productivity-oriented credit allocation.

Summary. The threshold analysis provides the clearest support for a nonlinear finance–growth relationship in Vietnam. While the linear and asymmetric models suggest weak or unstable average effects, the regime-switching specification reveals that the growth impact of credit depends critically on its level. These results offer qualified support for the "Too Much Finance" hypothesis: financial

deepening promotes growth up to a certain point, beyond which its marginal contribution declines substantially. The next subsection evaluates the robustness of these findings.

4.5 Robustness and stability analysis

To ensure that the identified nonlinear and threshold effects are not driven by model specification choices or extreme observations, several robustness checks are conducted.

Alternative lag specifications. First, we re-estimate the baseline ARDL and NARDL models using alternative lag selection criteria, including the Schwarz Bayesian Criterion (SBC). The main findings remain qualitatively unchanged. In particular, the linear specification continues to show no statistically significant long-run growth-enhancing effect of credit, while the nonlinear specification confirms the absence of long-run asymmetry. The threshold estimate remains within a narrow range around ln_credit ≈ 6.1, indicating that the identified cutoff is not sensitive to lag structure selection.

Excluding the COVID-19 period. Second, given the substantial macroeconomic disruptions associated with the COVID-19 pandemic, the models are re-estimated excluding observations from 2020Q1 to 2021Q4. The core results persist. The long-run linear effect of credit remains statistically weak, and the estimated threshold remains close to the baseline value. While short-run coefficients exhibit minor variations in magnitude, the overall regime-dependent interpretation is unaffected.

This suggests that the threshold effect is not merely an artifact of pandemic-induced volatility.

Alternative credit transformation. Third, we replace the credit-to-GDP ratio in levels with the quarterly growth rate of credit to assess whether the results are driven by scale effects. Under this alternative specification, credit growth displays short-run significance but does not generate a stable long-run cointegrating relationship. Importantly, the regime-dependent pattern observed in the baseline threshold model continues to indicate diminishing marginal returns at high levels of financial depth.

This reinforces the interpretation that it is the level of credit, rather than short-run fluctuations, that drives the nonlinear growth relationship.

Parameter stability. Finally, recursive estimation and stability diagnostics further confirm the robustness of the findings. As shown earlier in Figs. 1 and 2, both the CUSUM and CUSUMSQ statistics remain within the 5% confidence bands throughout the sample period. Additional recursive coefficient estimates reveal no persistent structural break in the long-run credit coefficient, although its magnitude gradually declines over time as credit depth increases.

Taken together, these robustness exercises strengthen confidence that the estimated threshold at approximately 123% of GDP reflects a structural feature of the finance–growth relationship rather than a transient econometric artifact.

5 Discussion and policy implications

The empirical findings of this study contribute to the ongoing debate on the nonlinear finance–growth nexus by providing country-specific evidence from a bank-dominated transition economy. While the linear ARDL results do not support a statistically strong long-run growth-enhancing effect of credit, the threshold regression reveals that the impact of financial deepening depends critically on the level of credit intensity.

Revisiting the finance–growth debate. The results partially align with the "Too Much Finance" hypothesis documented in cross-country studies. In the low-credit regime, financial deepening appears to promote economic growth, consistent with traditional theories emphasizing improved capital allocation and reduced financing constraints. However, once credit exceeds approximately 123% of GDP, its marginal contribution declines markedly and becomes statistically insignificant.

This regime-dependent pattern suggests that the finance–growth relationship is conditional rather than uniformly positive. In the early stages of financial development, credit expansion likely supported industrial upgrading and private sector expansion. At higher levels of leverage, however, additional credit may increasingly flow toward less productive uses or contribute to asset price inflation rather than real-sector productivity gains.

Unlike some cross-country studies that find outright negative effects of excessive financial deepening, the Vietnamese case exhibits diminishing returns rather than structural reversal. This nuance is important: the results do not imply that finance harms growth, but rather that its marginal growth-enhancing effect weakens beyond a certain threshold.

Structural features of bank-dominated systems. The threshold effect observed in this study may reflect structural characteristics of bank-centered financial systems. In economies where capital markets remain relatively underdeveloped, banking institutions play a dominant role in credit allocation. As financial depth increases, credit concentration in certain sectors—such as real estate or state-linked enterprises—may limit productivity spillovers.

Moreover, rapid credit expansion in transition economies can outpace institutional strengthening. Even if macroprudential frameworks improve over time, credit growth beyond the absorptive capacity of productive sectors may generate diminishing marginal returns.

Thus, the evidence supports a reinterpretation of financial deepening as a stage-dependent process: beneficial at moderate levels, but requiring qualitative improvements once quantitative expansion reaches saturation.

Policy implications. The identification of a statistically significant credit threshold carries several policy implications.

First, policymakers should avoid equating higher credit-to-GDP ratios with automatic economic progress. While financial deepening remains important, the results suggest that emphasis should shift from the quantity of credit toward its quality and allocation efficiency.

Second, macroprudential policy becomes increasingly relevant once credit approaches or exceeds the estimated threshold. Rather than stimulating further credit expansion, authorities may consider strengthening risk supervision, improving capital adequacy requirements and encouraging sectoral diversification.

Third, capital market development may provide a complementary channel to reduce reliance on bank credit. Diversifying financing sources—through corporate bond markets and equity financing—could alleviate concentration risks and enhance allocative efficiency.

Importantly, the results do not imply that credit should be forcibly reduced. Instead, they suggest that beyond a certain level, marginal growth gains from additional credit are limited, and further expansion should be carefully calibrated.

Broader implications for emerging economies. Although the analysis focuses on Vietnam, the findings may carry broader relevance for emerging and transition economies experiencing rapid financial deepening. The regime-dependent pattern identified here reinforces the argument that optimal financial depth is country-specific and contingent upon institutional capacity.

Future research may explore whether similar thresholds emerge in other bank-dominated systems and whether institutional quality shifts the location of such thresholds.

Concluding insight. Overall, the evidence supports a nuanced view of financial development: finance promotes growth, but only up to a point. Beyond that point, its marginal contribution declines, highlighting the importance of balancing financial expansion with institutional and structural reforms.

6 Conclusion

This study examines whether financial deepening continues to promote economic growth in a high-credit transition economy or whether diminishing marginal returns emerge beyond a certain threshold. Using quarterly data for Vietnam over the period 2010Q1–2024Q4, the analysis integrates linear ARDL, nonlinear ARDL (NARDL), and threshold regression techniques to evaluate both dynamic asymmetries and regime-dependent effects.

The findings provide three main insights. First, the baseline linear ARDL model confirms the existence of a long-run relationship between credit and growth but does not identify a statistically strong growth-enhancing effect of additional credit at higher levels of financial depth. Second, the nonlinear ARDL specification reveals limited short-run asymmetry but no statistically significant long-run divergence between credit expansions and contractions. Third, and most importantly, the threshold regression identifies a statistically significant cutoff at ln_credit = 6.11, corresponding to approximately 123 percent of GDP. Below this level, credit expansion contributes positively to growth. Above it, the marginal effect declines substantially and becomes statistically insignificant.

Taken together, these results suggest that the finance–growth nexus in Vietnam is nonlinear and regime-dependent. Financial deepening appears beneficial during earlier stages of development but exhibits diminishing returns once credit intensity surpasses a critical level. The evidence thus offers qualified support for the “Too Much Finance” hypothesis: finance does not necessarily harm growth, but its marginal contribution weakens beyond a saturation point.

From a policy perspective, the findings imply that continued quantitative credit expansion may not generate proportionate growth gains once financial depth becomes elevated. Policy emphasis should therefore shift from expanding credit volume toward enhancing allocation efficiency, strengthening regulatory oversight and diversifying financial markets. Such measures may help sustain growth without exacerbating macro-financial vulnerabilities.

This study contributes to the literature in three ways. First, it provides high-frequency, country-specific evidence from a bank-dominated transition economy. Second, it combines asymmetric and threshold approaches within a unified empirical framework. Third, it identifies a concrete regime cutoff that refines the interpretation of financial deepening in emerging markets.

Several limitations should be acknowledged. The analysis focuses on aggregate credit measures and does not distinguish between sectoral allocation or borrower composition. In addition, while the threshold approach captures regime shifts based on credit levels, it does not explicitly incorporate institutional quality or financial structure indicators that may influence the location of the optimal threshold. Future research may extend the analysis by integrating sectoral credit data, institutional indices or cross-country comparative frameworks to assess the generalizability of the identified threshold.

Overall, the evidence supports a nuanced understanding of financial development: finance promotes growth, but only up to a point. Recognizing and managing this threshold is essential for sustaining balanced economic development in emerging and transition economies.

Declarations

Conflicts of Interest

The authors declare no conflict of interest.

Funding

This research received no external funding.

Author Contribution

Q.L.P. conceived and designed the research, identified the data sources, performed the data analysis, and wrote and finalized the manuscript. H.T.K.T. co-designed the research, collected the data, and provided critical comments on the manuscript. N.N.H. collected the data, processed the dataset, and conducted the econometric analysis using Stata. T.A.H. contributed to data collection, interpreted the empirical results, and helped develop the conceptual ideas of the study. M.C.L. coordinated the integration of co-authors' comments, organized the structure of the manuscript, and revised the manuscript based on feedback from the co-authors. All authors reviewed and approved the final manuscript.

Acknowledgement

The authors would like to acknowledge the institutional support provided by Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam.

Data Availability

The data used in this study are obtained from publicly available sources, including the General Statistics Office of Vietnam (GSO, now NSO), the State Bank of Vietnam (SBV), the International Monetary Fund (IMF), and the World Bank databases. The authors compiled quarterly macroeconomic data for the period 2010Q1–2024Q4 from these sources for the purposes of the empirical analysis. The compiled dataset used in this study is available from the corresponding author upon reasonable request.

References

1. Levine R (2005) Finance and growth: Theory and evidence. In P. Aghion & S. N. Durlauf (Eds.), *Handbook of economic growth* (Vols. 1-A, Vol. 1, pp. 865–934). Elsevier. Retrieved from https://doi.org/10.1016/S1574-0684(05)01012-9
2. Arcand JL, Berkes E, Panizza U (2015) Too much finance? J Econ Growth 20(2):105–148. https://doi.org/10.1007/s10887-015-9115-2
3. Cecchetti SG, Kharroubi E (2019) Why Does Credit Growth Crowd Out Real Economic Growth? Manch School 87(S1):1–28. https://doi.org/10.1111/manc.12295
4. Amoh JK, Abdul-Mumuni A, Amankwa Fosu R (2025) Revisiting the debt–growth nexus in sub-Saharan Africa: fresh evidence from panel nonlinear ARDL approach. Int J Emerg Markets 20(8):3342–3361. https://doi.org/https://doi.org/10.1108/IJOEM-04-2023-0598
5. Khanday IN, Tarique M, Wani IU, Dar MH (2024) Poverty and financial development: an asymmetric and nonlinear ARDL analysis for India. J Economic Stud 51(4):764–782. https://doi.org/https://doi.org/10.1108/JES-03-2023-0129
6. Law SH, Azman-Saini WNW, Ibrahim MH (2013) Institutional quality thresholds and the finance–growth nexus. J Banking Finance 37(12):5373–5381

7. Sahay R, Cihak M, N'Diaye PM, Barajas A, Ayala Pena DB, Bi R, Yousefi R (2015) Rethinking Financial Deepening: Stability and Growth in Emerging Markets. IMF Publications Newsl 2015(008):1–41. https://doi.org/https://doi.org/10.5089/9781498312615.006
8. World Bank (2024) *Vietnam Macro Monitoring, October 2024*. World Bank Group. Retrieved from https://hdl.handle.net/10986/42580
9. Nguyen PT (2022) The Impact of Banking Sector Development on Economic Growth: The Case of Vietnam's Transitional Economy. J Risk Financial Manage 15(8):358. https://doi.org/10.3390/jrfm15080358
10. Pham HM, Nguyen PM (2020) Empirical research on the impact of credit on economic growth in Vietnam. Manage Sci Lett 10(12):2897–2904. https://doi.org/https://doi.org/10.5267/j.msl.2020.4.017
11. Hansen BE (1999) Threshold effects in non-dynamic panels: Estimation, testing, and inference. J Econ 93(2):345–368. https://doi.org/10.1016/S0304-4076(99)00025-1
12. Ntarmah AH, Kong Y, Manu EK (2021) Investigating the dynamic relationships between credit supply, economic growth, and the environment: empirical evidence of sub-regional economies in Sub-Saharan Africa. Environ Sci Pollut Res 28(5):5786–5808. https://doi.org/10.1007/s11356-020-10875-0
13. Shin Y, Yu B, Greenwood-Nimmo M (2014) Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. In: Sickles RC, Horrace WC (eds) Festschrift in Honor of Peter Schmidt. Springer New York, New York, NY, pp 281–314. https://doi.org/10.1007/978-1-4899-8008-3_9
14. Pesaran MH, Shin Y, Smith RJ (2001) Bounds testing approaches to the analysis of level relationships. J Appl Econom 16(3):289–326. https://doi.org/10.1002/jae.616

Figures

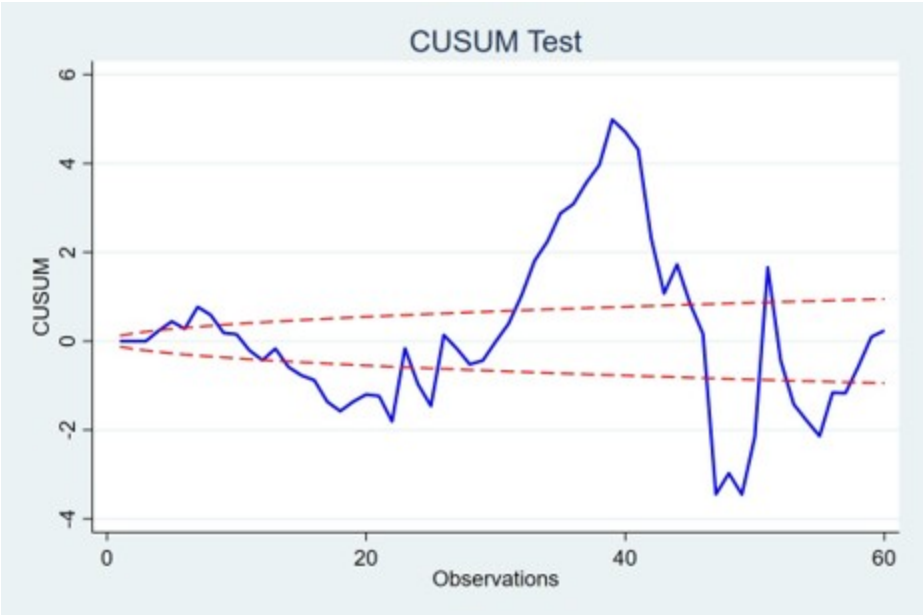


Figure 1

CUSUM test for parameter stability

Note: *The cumulative sum remains within the 5% critical boundaries, indicating stability of the estimated coefficients.*

Source: *Source: Authors' calculations based on data from the General Statistics Office of Vietnam, IMF, and the State Bank of Vietnam..*

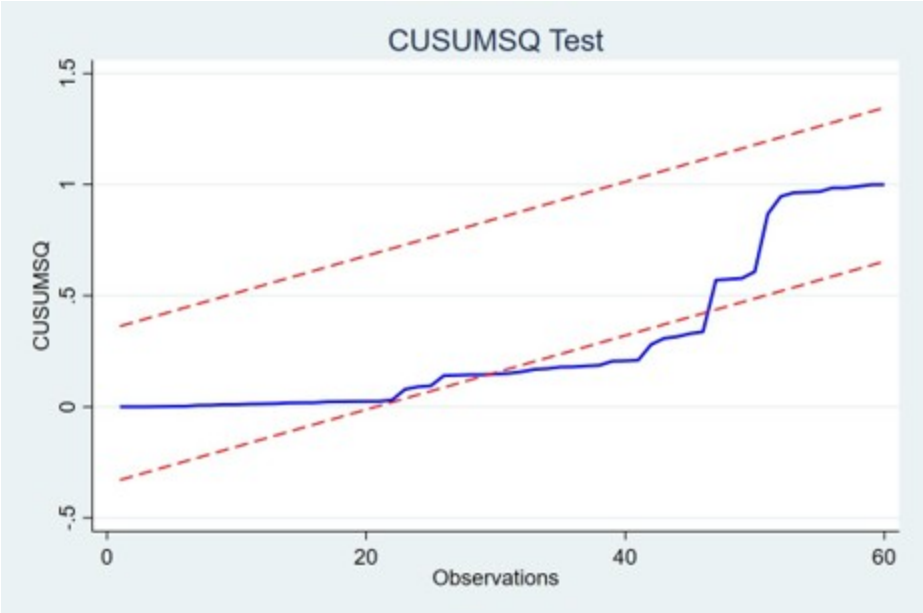


Figure 2

CUSUMSQ test for parameter stability

Note: *The cumulative sum of squares statistic remains within critical bounds, suggesting no significant structural breaks.*

Source: *Source: Authors' calculations based on data from the General Statistics Office of Vietnam, IMF, and the State Bank of Vietnam..*