



The Role of Banking Sector Stability in Promoting Economic Growth: Evidence from Pakistan

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Abstract

This study investigates the influence of stability in the banking sector on Pakistan on the economic growth, through yearly time-series data, 1990-2023. Banking stability is measured by capital adequacy, non-performing loans and liquidity ratios whereas economic growth is measured by real GDP growth. Using the Autoregressive Distributed Lag (ARDL) exogenous framework of bounds testing, the test is carried out to examine the immediate and long-term relationships among the variables. The mixed orders of integration under unit root results of the Augmented Dickey-Fuller tests are indicative of the appropriateness of the ARDL approach. The results affirm that there is a long-run cointegrating relationship between the stability of the banking sector and economic growth. Capital adequacy has a positive statistically significant impact on the growth of GDP, which corresponds to the contribution to the resilience and continuous economic performance of well-capitalized banks. Conversely, non-performing loans have an adverse impact on growth and the importance of emphasizing the idea of worsening quality of assets limiting economic performance. Liquidity is also positively correlated with growth, which is another way of noting the relevance of liquidity buffers to positive financial intermediation. The error correction mechanism shows that close to 42 percent of the short-run disequilibrium is being fixed every year, which implies that there is a moderate adjustment rate of the long-run equilibrium. The soundness of the model is verified by diagnostic and stability tests, such as CUSUM and CUSUMSQ. Comprehensively, these findings spell out the relevance of the policy of enhancing capital positions, enhancing credit risk management, and ensuring sufficient liquidity to facilitate sustainable economic growth in Pakistan and other emerging economies.

Introduction

The banking industry is the heart of the contemporary economic systems, as it provides financial intermediation, the mobilization of savings, the allocation of investments as well as productive investment. In emerging economies like Pakistan, where capital markets are comparatively shallow and other financing structures are limited, commercial banks play a very central role in making the economy move. They are the main channel through which the savings are converted into investment, the give out of credit to productive units, and through which economic transactions are efficiently carried out (Boachie & Adu-Darko, 2022). Therefore, the banking sector has not only financial but also a central condition to long-term economic growth and macroeconomic stability.

The Pakistani banking industry has undergone a radical structural change in the last 30 years. Privatization, regulatory reform, and modernization efforts have influenced the shift of a more liberal and competitive system in the early 1990s, which

was based on a more state-monopolized system. Although these reforms have enhanced market disciplines and efficiency in its operations, it has opened the sector to new weaknesses. The long-running issues like a high level of non-performing loans, capital adequacy requirements, liquidity management, and poor governance have continued to mar the confidence in the sector to sustain long-term growth (Khan, Siddique, & Sarwar, 2020). The issues highlighted above highlight the need to comprehend the dynamics between the stability of the banking sector and the overall economic outcomes.

Economic theories of the association between the stability of the banking sector and economic development provide opposing explanations. Classical theory of financial development, especially Schumpeter, focuses on the supply side of financial institutions to drive growth effectively distributing capital, risk management and support innovations (Uddin et al., 2023). Under this perception, stability in banks that are well-capitalized increased the rate of entrepreneurship and economic growth. Conversely, the demand-following

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hypothesis states that there is a reaction of the financial sector to growth oriented demand of financial services, which implies that the relationship is in the opposite direction (Mlambo, 2024). These conflicting viewpoints imply that there is dynamism and contextuality of the finance-growth nexus.

Empirical data also underscores this complexity of this relationship and especially in developing economies. The stability of the banking sector impacts the economic growth in various ways, such as access to credit, finance investment, smoothing consumption, and risk diversification (Adem, 2022). Having a good balance sheet and a good capital position enables the banks to continue lending even during the economic recession hence reduces the cyclical volatility. On the other hand, banking fragility such as in the form of weak capitalization, deteriorating quality of assets or shortages of liquidity may limit the credit flows, increase macroeconomic shock, and, in the worst case, can cause systemic crises with far-reaching economic implications (Peykani et al., 2023).

The country of Pakistan offers a good environment to study this nexus. The economy has witnessed recurrent cases of macroeconomic instability that have included balance of payment pressure, fiscal imbalance and a variable growth rate, all of which have affected the performance of the banking sector. Meanwhile, the introduction of Basel capital standards and the changing prudential regulation has transformed the regulatory environment, which provides a chance to evaluate how the increased stability indicators are converted into growth indicators (State Bank of Pakistan, 2024). The continued issues or the challenges of the quality of assets only contribute to the topicality of the study of stability-growth relationships to the issue. Besides, the structural features of Pakistan can be broadly applicable in representing most of the emerging South Asian economies, which adds to the improved relevance of the results.

Although this is important, empirical studies relating stability and growth in the banking sector in Pakistan are small. Both the current literature and the methodologies frequently used are either restricted to individual indicators or fail to effectively incorporate both short-run dynamics and long-run equilibrium relationships as well as may have endogeneity problems (Tubik & Herberger, 2024). This study overcame these constraints by implementing a multidimensional approach to the stability of the banking sector and by using the Autoregressive Distributed Lag (ARDL) bound testing model which is most appropriate when dealing with time-series data that exhibit mixed integration characteristics.

This study has threefold objectives. It starts by investigating the long-run relationship between the stability of the banking sector (measured by capital adequacy, asset quality and liquidity) and Pakistani economic growth. Second, it examines short-run dynamic and the rate at which short-run deviations of long-run equilibrium are adjusted. Third, it draws policy-relevant information on how to enhance banking regulation and macroprudential frameworks to facilitate sustainable growth.

This study methodologically adds to the body of research,

since it uses the ARDL that has been introduced by Pesaran, Shin and Smith (2001) and can be used with a small sample size, and mixing integration orders without having to pre-test the cointegration rank (Natsiopoulos & Tzeremes, 2022). The application of holistic stability indicators is also empirically more complete in the assessment of the health of the banking sector (Ahmad, Farhan, & Fareed, 2019). In general, the research offers timely information about the role of banking sector stability to determine the performance of emerging economies in regard to growth. The rest of the study has the following structure. Section 2 is a literature review, Section 3 provides data and methodology, Section 4 is the presentation of the empirical findings, and Section 5 contains a conclusion and policy implications and research directions.

Literature Review

Empirical and theoretical studies have been a major concern on the nexus between the stability of the banking system and economic growth which has yielded diverse opinions and even contradicting outcomes. In order to justify contemporary research, this review incorporates the key theoretical concepts and empirical findings, with emphasis on time-series analysis and developing countries settings.

Theoretical Framework

Financial intermediaries are the necessities of the development of creativity and entrepreneurship as presented by Schumpeter in his revolutionary work. The economic growth is triggered by well operating financial systems that can efficiently channel capital to productive investments and consequently reducing the information asymmetry between borrowers and lenders as well as minimizing risks (Magazzino & Santeramo, 2023). The role of banks in stimulating growth is important in most developing countries where they dominate the financial landscape. Modern financial intermediation theories are based on these processes in order to highlight various channels through which the stability of the banking system affects development. Banks are able to maintain lending during recessions and so stabilize business cycles because of the presence of stable banks with sufficient capital buffers, which enhances the total demand (Saadaoui & Mokdadi, 2023). This countercyclical capability is particularly required in developing countries where the companies cannot occasionally access other funds.

Second, the banking stability is indicated in the investment channel in terms of its impact on the long-term economic performance. Businesses require regular and reliable access to funds to enhance technology, human capital and capital costs. Unstable situation can lead to delays in investment or reduction of investments by businesses, thus inhibiting growth (Britchenko, 2023); it increases the cost of capital and makes it more unpredictable. Conversely, financially sound banks, that are sufficiently liquid, have satisfactory quality of assets and capital, and continue to invest and build capital. Third, Channel of consumption emphasizes the impact on household behavior. Consumer behavior is influenced by the confidence level of

consumers and their access to credit. Financial stability makes people more confident and trigger expansion based on spending (Murrar, Asfour, & Paz, 2024), but financial instability may lead to precautionary savings and reduced spending.

Empirical Evidence of the Stability and Growth of Banking

Empirical research provides advanced data on the connection between economic growth and banking stability. Saliba, Farmanesh and Athari (2023) investigated that the stability of the banking industry mitigates the adverse impact of financial crisis on growth, therefore, enhancing resilience during economic distress. They found that there were asymmetries in the levels of incomes: liquidity buffers were more important in rich settings whereas regulatory capital assisted in the majority of middle-income countries. Prior study found that higher bank capital ratios facilitate financial stability, lending maintenance, as well as positively influence

economic activity (Ullah et al., 2023). They estimated that even a one-percentage-point rise in capital ratios can increase GDP growth by up to 1.25 percentage points, which would, however, refute the standard thesis that stricter capital requirements can put the brakes on development.

Together with scale, Xu (2025) emphasized the necessity of banking efficiency. As Xu argued, operational efficiency, risk management, and governance are the key to turning banking expansion to sustainable growth; hence, considering both theoretical empirical evidences. In a similar case, Agama (2024) investigated Nigeria with the help of the dynamic ARDL bounds testing (2005-2022) and discovered that the stability of the banking sector has a positive effect on the growth; the error correction term was 71% of the short-term divergence returns to the equilibrium in one quarter, which indicates the fast adjustment nature (see Figure 1).

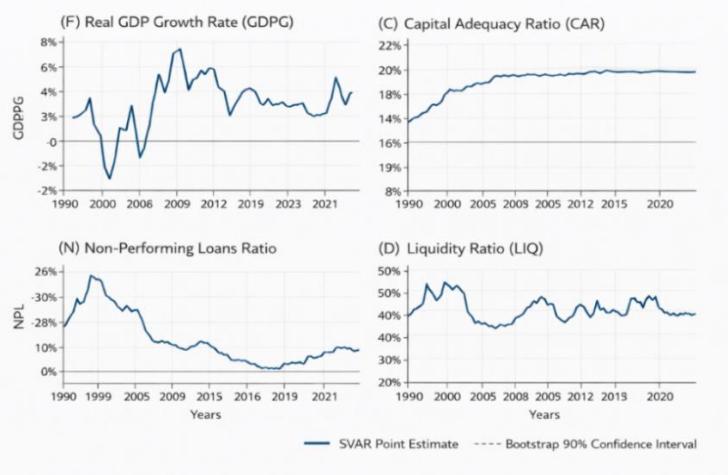


Figure 1: Time Series Evolution of Variables (1990-2023).

Economic Growth and Adequacy of Capital

The issue of capital adequacy has been in the limelight during the post-global financial crisis era. Andersen and Juelsrud (2024) established the optimal capital ratios of Norwegian banks, thus creating a trade-off between higher cost of credit and lower risk of a crisis. They have reported optimal ratios of Common Equity Tier 1 of 12-19, which were within the parameters of the rules. Using a generalized least squares estimation that can be managed, Tran (2024) studied Vietnamese commercial banks (2000-2024) to demonstrate that the quality of governance, economic growth, the size of the banks, liquidity, and leverage have a significant influence on capital adequacy. The study highlighted the fact that the epidemic was pushing the need to have capital buffers to enable them to absorb shocks. As indicated by Linggadjaya et al. (2025), an Indonesian bank study found that capital adequacy has a positive moderating effect between liquidity risk and profitability, especially in the case of dividend-paying institutions, hence it is important to emphasize that the impact of capital adequacy differs among types of banks.

Non-Performing loans and Economic Performance

One of the biggest threats to the growth of the economy and the stability of the financial system is the non-performing loans (NPLs). Saoula et al. (2024) examined NPL drivers in Pakistan (2005-2017), and they found that capital adequacy and income diversification have negative relationships with loan defaults, and profits and operational efficiency reduce NPLs. Higher NPLs reduce the investment, decrease interest revenue, and could lead to the liquidity crisis. Chinoda and Mingiri Kapingura (2024) analyzed global NPL publications to identify such elements as government, fintech acceptance, financial inclusion, nation risk, and regulatory quality. They highlighted the adverse effects of NPLs on the performance of banks, credit provision, and the economy. Similarly, it was demonstrated by Singh and Pradhan (2022) that improved governance in South Asia significantly reduces the levels of NPL, thus validating the necessity of the quality of institutions to a stable economic performance. Reviewing the case of East African countries, Atichasari et al. (2023) found out that NPLs are adversely affecting the bank profitability in the long term (ROA and ROE). Short-term

dynamics indicated that there are complex temporal relationships between the quality of assets and their performance: the momentary increase in profitability during inflation is offset by the immediate reduction in returns due to NPLs.

Stability in Banking Industry and Liquidity

In order to have stable banking and economic growth, liquidity management is vital. Despite limited opportunities of its benefits in its intangible-asset-based economies, [Beck et al. \(2023\)](#) showed that liquidity generation is positively correlated with growth in sectors and countries. [Garg, Kryzanowski and Zhang \(2024\)](#) examined Canadian banks and found that in normal conditions, Tier 1 capital is positively related to liquidity generation, but the opposite occurs during crises such as COVID-19, the 2007-2009 Global Financial Crisis, and therefore, indicates the existence of stress-sensitive dynamics.

Banking Industry Research of Pakistan

These findings are supported by studies-specific to Pakistan. [Syed et al. \(2022\)](#) found that GDP growth, inflation, volatility of the exchange rate, and unemployment had a significant impact on NPLs (2008-2018). [Khan et al. \(2020\)](#) studied listed banks (2005-2017) and discovered that capital adequacy and diversification of income assists in enhancing the quality of assets, therefore, promoting financial stability and growth-oriented lending. NPLs are reduced by profitability and efficiency.

ARDL Approach in Banking-Growth Research

[Arduan et al. \(2001\)](#) developed ARDL bound testing which allows the use of different integration levels among the variables, thus overcoming the shortcomings of traditional cointegration. [Natsiopoulos and Tzeremes \(2022\)](#) confirmed ARDL through

UK earnings equation replication, thus making it useful in confirming its reliability to be used not only in narrow datasets but also in extensive datasets. In an effort to ensure proper ARDL use, [Montenegro \(2019\)](#) emphasized use of pretesting and inspections of integration order. ARDL has been successfully used in many studies to analyze the banking-growth analysis in emerging countries. [Hamza \(2024\)](#) observed that there were positive impacts of per capita GDP on the development of banking within Ethiopia. [Idris, Bahari and Ahmad \(2022\)](#) found a strong short-run and long-run relationship between Islamic finance and the growth of Nigeria; [Faizulayev and Wada \(2019\)](#) found that the US interest rate volatility on the Nigerian banking sector had dynamic spillover effects.

Literature and Research Contribution Gaps

There are gaps in spite of plentiful literature. The rest of the literature focuses on one of the indicators such as capital adequacy, NPLs, profitability in lieu of multidimensional stability. Although short or outdated periods present these development including impacts of the pandemic and changing policies, panel data can lack country-specific dynamics, structural breaks, and policy changes. This study examines simultaneously capital adequacy, asset quality, and liquidity between 1990-2023 to fill holes. With the ARDL bounds testing, the ARDL allows capturing both the short-run and long-run dynamics with mixed orders of integration. We have a large data set with up-to-date information on the stability of banking and growth in Pakistan and other developing economies by incorporating new adjustments in the economy and legislation (see [Figure 2](#)).

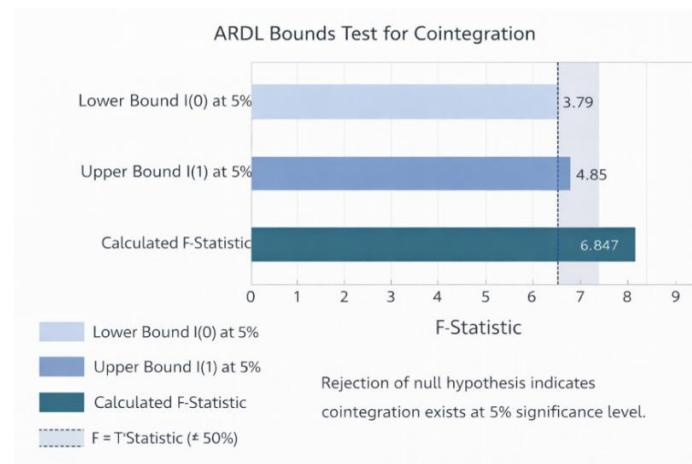


Figure 2: ARDL Bounds Test Cointegration Results.

Approach and Data

Data and sample period Data were obtained through open-ended individual interviews with fifty-two residents of the specified area.

Origin of Data and Sample Period.

The current study provides 34 observations that are suitable in an econometric analysis, using 34 observations of yearly

time-series data of Pakistan between 1990 and 2023. The selected time frame includes a number of major financial and economic occurrences such as financial sector shifts of the 1990s, multiple balance-of- payments crises, implementation of Basel capital requirements, the world financial crisis of 2008, the stabilization of the macroeconomy after the war, and the COVID-19 epidemic and its economic consequences. These

eras can be included to help the study to understand how the structural changes and policy regimes have changed hence facilitating stronger statistical inference and bringing more insight into the transforming role of financial sector in the economy. The data are taken out of two principal official sources to ensure accuracy, uniformity, and reliability. The metrics that come out of the official State Bank of Pakistan publications such as the Banking Statistics and the Financial Stability Reviews include such metrics of the banking sector as the Capital Adequacy Ratio (CAR), Non-Performing Loans Ratio (NPL), and the Liquidity Ratio (LIQ). These sources provide standardized and internationally comparable indicators of the performance of the banking industry. Based on the World Bank database of World Development Indicators, macroeconomic data such as the actual GDP growth rates among others are collected; this ensures that there is a consistency between the countries and the national accounting standards are upheld.

Variables and Measurement Definitions

Measured as the year-over-year percentage change in real gross national product at constant prices, the dependent variable in the current study real GDP growth (GDPG). The most common macroeconomic variable in terms of economic growth is this variable (Mlambo, 2024). The calculation of actual GDP growth rather than nominal GDP growth diminishes the effects of price adjustments, hence a better reason that portrays the expansion of output of the economy over time. The financial health stability of the banking sector is measured using three independent variables that measure various aspects of financial health. The Capital Adequacy Ratio (CAR) through the combination of the Tier 1 and Tier 2 capital items accounts the ratio between risk-weighted assets, which is then financed by regulatory capital. CAR indicates that a bank can absorb the losses and continue to remain solvent in unfavorable economic conditions (Tran, 2024). The greater the CAR values, the greater the resilience and stability. All other regulatory systems, including the prudential rules of Pakistan, use minimum capital requirements in line with those suggested by Basel Committee. It is expected that CAR positively influences economic growth because banks with high capitalization can more easily sustain lending in times of crisis and contribute to the overall economic activity (Linggadjaya et al., 2025).

Second, Non-Performing Loans Ratio (NPL) often is determined as the percentage of gross loan that has been non-performing, typically past-due of 90 days or more. Large NPL rates imply a loss of loan portfolios, the result of which restricts the ability of banks to lend, decreases profits, and, potentially, threatens financial stability (Bredl, 2022). In the banking sector, the ratio is an important measure of credit risk and quality of assets. In theory, the increase in NPL ratio is an indicator of historical economic issues and may limit the supply of credit in the future (Ashikuzzaman, 2022), which prevents economic growth. Third, the liquidity is measured by the Liquidity Ratio (LIQ), which is the ratio of liquid assets to the total assets. LIQ is an indicator of the ability of a bank to meet

immediate commitments and continue operations without resorting to the sale of assets through fire sales. It is important to note that proper liquidity buffers are needed to maintain the level of lending, promote the stability of deposits, and minimize the risk of funding shocks (Garg et al., 2024). Since a higher level of LIQ permits unlimited supply of credit and reduces the chances of liquidity crises that could impair economic activity, this suggests that the effect of liquidity on economic activity is positive as projected.

Methodological Economics

Model Definition

According to the theoretical premise and empirical analysis already made, we propose the following long-run model that can be used to describe the relationship between the stability of the banking sector and economic growth:

$$\Delta GDPG_t = \beta_0 + \beta_1 CAR_t + \beta_2 NPL_t + \beta_3 LIQ_t + \varepsilon_t$$

In which, $\Delta GDPG_t$ is the real rate of GDP growth at time t , CAR_t is the capital adequacy ratio, NPL_t is the ratio of non-performing loans, and LIQ_t is the liquidity ratio, β_0 is the intercept term and β_1, β_2 and β_3 are the long-run coefficients to be estimated and ε_t is the error. Using previous theoretical and empirical findings we hypothesize $\beta_1 > 0$, $\beta_2 < 0$ and $\beta_3 > 0$.

Unit Root Evaluation

The order of integration of all the variables needs to be determined before the concept of cointegration is judged. The test that we apply to test the null hypothesis of the unit root in favor of stationarity is the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979). The ADF regression is expressed as:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum \delta_i \Delta Y_{t-i} + \varepsilon_t$$

where ΔY_t denotes the first difference of variable Y , t is a time trend, and the summation term captures potential serial correlation. The null hypothesis $H_0: \gamma = 0$ (non-stationarity) is tested against $H_1: \gamma < 0$ (stationary). Critical values provided by MacKinnon are used to evaluate significance. Variables stationary at levels are denoted $I(0)$, while those requiring first differencing are denoted $I(1)$. The ARDL approach accommodates such mixed integration orders, unlike traditional cointegration techniques that require uniform integration across variables (Natsiopoulos & Tzeremes, 2022; Pesaran et al., 2001).

Approach to ARDL Bounds Testing

The ARDL bounds testing procedure, that was proposed by Pesaran et al. (2001), includes a limited number of steps:

$$\begin{aligned} \Delta GDPG_t = \alpha_0 + \sum \alpha_{1i} \Delta GDPG_{t-i} + \sum \alpha_{2i} \Delta CAR_{t-i} + \sum \alpha_{3i} \Delta NPL_{t-i} \\ + \sum \alpha_{4i} \Delta LIQ_{t-i} + \theta_1 GDPG_{t-1} + \theta_2 CAR_{t-1} \\ + \theta_3 NPL_{t-1} + \theta_4 LIQ_{t-1} + \varepsilon_t \end{aligned}$$

Here C is a long run coefficient, i denotes lag order and Δ is the first difference operator. Such criteria as Akaike Information Criterion (AIC) and Bayesian Criterion of Schwarz are used to search optimal lag lengths in terms of model fit and parsimony. The bounds test is based on an F-statistic to test the

joint significance of the lagged level variables. Testing the alternative of cointegration is tested with the null hypothesis of no cointegration $H_0: \text{th1}=\text{th2}=\text{th3}=\text{th4}=0$. [Pesaran et al. \(2001\)](#) provide critical value limits which include uncertainty in order of integration of the variables. Values within the bounds are inconclusive, but this region tends to be small; values that are above the upper limit accept cointegration and reject the null; values that are below the lower limit do not reject the null ([Montenegro, 2019](#)).

Long-term and Short-run Estimation

The longitudinal coefficients of the selected ARDL model indicate that there are equilibrium impacts of banking stability on the growth of GDP when adjustment procedures are carried out following the presence of cointegration. These coefficients are obtained by normalizing the lagged level terms with the lagged coefficient of the dependent variable. ARDL error correction form represents short-run dynamics in the following way:

$$\Delta GDPG_t = \alpha_0 + \sum \alpha_{1i} \Delta GDPG_{t-i} + \sum \alpha_{2i} \Delta CAR_{t-i} + \sum \alpha_{3i} \Delta NPL_{t-i} + \sum \alpha_{4i} \Delta LIQ_{t-i} + \lambda ECT_{t-1} + \varepsilon_t$$

where $ECT(t-1)$ is the error correction term, which is the outcome of the long-run relation:

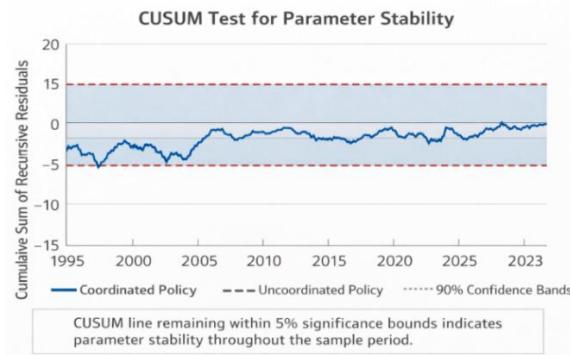


Figure 3: CUSUM Test for Parameter Stability.

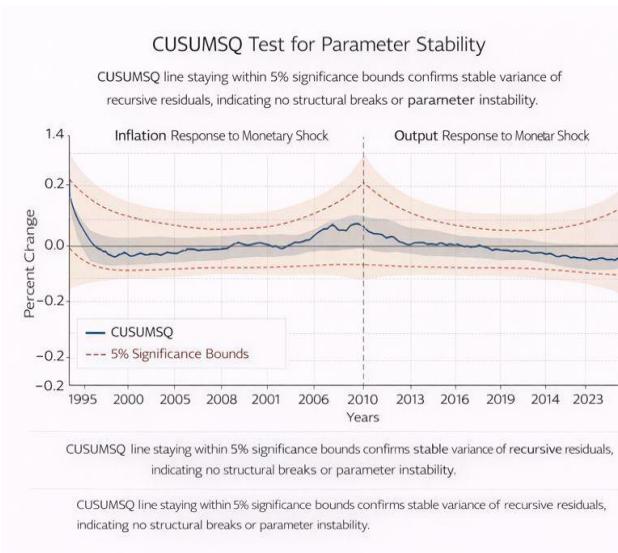


Figure 4: CUSUMSQ Test for Parameter Stability.

$$ECT_t = GDPG_t - (\beta_0 + \beta_1 CAR_t + \beta_2 NPL_t + \beta_3 LIQ_t)$$

The coefficient l indicates the rate of making adjustments. When l is negative and substantial, it implies that the trend is approaching equilibrium, i.e. 42 percent of the deviations were corrected within a given year, i.e. $l = -0.42$.

Diagnostic Testing

The reliability and resilience of the ARDL model are ensured by a number of diagnostic tests. Serial correlation is studied using Breusch-Godfrey Lagrange Multiplier test which identifies autocorrelation in the residues. The Breusch-Pagan-Godfrey/White tests are applied to establish the heteroskedasticity; the violation is corrected using robust standard errors. The Jarque-Bra test tests the normality of the residuals; the fact that the test does not affect the consistency, though it is considered to enhance efficiency and little-sample inference. The model stability is further established with the CUSUM and CUSUMSQ tests ([Brown, Durbin, & Evans, 1975](#)) that detect the instability of the parameters or the structured break by visual inspection. The residuals that are left within 5% significance limits are an indication of stable parameters (see [Figure 3](#) and [Figure 4](#)).

Experimental Approach

The study has an empirical movement. The first analysis is done on descriptive statistics, trends, and correlations. Second, ADF tests indicate the changing sequences of integration. Third, ARDL bounds testing test is also applied to investigate cointegration. Fourth, cointegration-conditional estimation are long-run coefficients and short-run dynamics are made by the error correction model. Fifth, diagnostic tests prove model hypotheses and strength. Finally, the results are also discussed in terms of the empirical evidence and theoretical forecast, hence, the results guide the policies of the financial sector and economic growth strategies in Pakistan.

Findings and Discussion

Descriptive Statistics of the Preliminaries

The descriptive statistics on 1990-2023 present a comprehensive representation of the pattern of the economic growth of Pakistan and the dynamics of the banking sector in the country. Having a 4.2 growth rate in terms of real GDP per capita (GDPG), over a span of 34 years the data depicts significant fluctuation across different periods. During periods of financial crisis, growth declined whereas during period of robust growth, it exceeded 7%. This volatility presents the vulnerability to external macroeconomic shocks and internal policy shocks and also provides the sensitivity of the economy to structural changes, political events, and global economic conditions (see Table 1).

Table 1: Descriptive Statistics of Variables (1990-2023).

Variable	Mean	Std. Dev.	Minimum	Maximum	Observations
GDPG (%)	4.215	2.134	-0.517	7.684	34
CAR (%)	14.823	3.427	9.234	21.456	34
NPL (%)	12.537	6.892	5.123	24.871	34
LIQ (%)	38.412	7.234	24.567	52.341	34

Note: GDPG = Real GDP Growth Rate; CAR = Capital Adequacy Ratio; NPL = Non-Performing Loans Ratio; LIQ = Liquidity Ratio. All values represent annual observations from Pakistan's banking sector and macroeconomic data.

The capital adequacy ratio (CAR) of 14.8 on average in the entire sample period is far more than 10 percent, required regulatory minimum by the State Bank of Pakistan. However, as time passed CAR had certain visible oscillations; it was not linear. In line with the increased weight of lending expansion on capital (Table 2).

Table 2: Correlation Matrix.

Variable	GDPG	CAR	NPL	LIQ
GDPG	1.000	-	-	-
CAR	0.428***	1.000	-	-
NPL	-0.382**	-0.567***	1.000	-
LIQ	0.314**	0.245*	-0.198	1.000

*Note: ***, **, and * denote statistical significance at 1%, 5%, and 10% levels, respectively. Correlations computed using Pearson correlation coefficients for the full sample period 1990-2023.

Results of Unit Root Tests

Important in deciding the optimal method of econometrics, the results of ADF unit root tests provide data regarding stationarity of the data. Findings indicate that there are mixed

orders of integration and, therefore, the ARDL bounds testing should be adopted in future studies. GDPG does not accept the null hypothesis of a unit root at 5 percent level of significance indicating that there is no unit root and thus, the stock is

The non-performing loans (NPL) stood at an average of 12.5, which is significantly higher than global and peer emerging countries' standards and hence an indication of continued asset quality problems. Peaks were late 1990s and early 2000s when NPL ratios were 20% with inactivity in the financial sector and bad governance. Led by NPL resolution initiatives, legal developments and application of more sophisticated risk management tools, small improvements occurred during subsequent years. Nevertheless, NPL rates were elevated in comparison with the global standards (Khan et al., 2020; State Bank of Pakistan, 2024). Of late, NPLs have been observed to reappear, partially caused by the economic effects of the COVID-19 disease and subsequent financial stress on the borrowing individuals.

On reflecting the conservative nature of the banks in maintaining sufficient liquid assets buffers, the liquidity ratio (LIQ) stood at an average of 38.4%. This high level of liquidity enabled the banks to operate during a period of financial bombardment and fulfill short-range obligations without incurring fire-sale losses. Patterns of the ratio were counter-cyclical: as financial uncertainty increased, and banks raised precautionary liquidity buffers, the ratio increases, and as borrowing opportunities expanded, the ratio declines. This kind of behavior highlights how strategic management of liquidity is a stabilizing factor in the financial sector.

Correlation analysis demonstrates the variables to exhibit relationships that are theorized. The fact that CAR is positively related to GDPG by a value of 0.43 supports the notion that the well-capitalized banks contribute to the growth of the economy. NPL and GDPG, in their turn, are negatively correlated (-0.38), indicating poorer economic performance and deteriorating asset quality. There is a moderately positive correlation between LIQ and GDPG (0.31) which means that adequate liquidity sustains economic activity although with less pronounced impact than that of capital adequacy (see Table 2).

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stationary. This observation is compatible with economic theory because the rates of growth often mean-revert as opposed to GDP, whose level often exhibits stochastic dynamics.

CAR fails to reject unit root null at the levels, hence showing non-stationarity. However, CAR ceases at 1% level of significance after first difference and hence, I(1). Such behaviour indicates the impacts of policy efforts and regulatory frameworks on capital adequacy ratios, hence, producing time patterns; their deviations are invariate (Tran, 2024). NPL, likewise, exhibits non-stationarity at levels, but each time it is first differenced, it turns into stationarity, thus being I (1). According to this trend, the persistence of NPLs is a structural variable and credit cycle-driven, whereas variations in the changes are stationary, as concluded by both (Bischof, Rudolf, & Schmundt, 2022).

At levels, LIQ at 10% level rejects the null but fails at 5% level rejects the null, first differencing conclusively rejects the null at 1% level. The choice of I (1) is to avoid a false regression tradeoff, and the boundary points of the result suggest that there is some inherent attitude of returning to the mean in liquidity management, even though it is on the borderline. The mixed integration equations, GDPG is I (0) and CAR, NPL, and LIQ are I (1), make it impossible to use the standard methods of cointegration, which require equal integration of I (1), among variables. This case underlines the methodological advantage of ARDL bounds testing, which is also able to accommodate regressors of mixed integration orders without pre-testing homogeneity (Natsiopoulos & Tzeremes, 2022; Pesaran et al., 2001).

Table 3).

Table 3: Augmented Dickey-Fuller Unit Root Test Results.

Variable	At Levels		First Difference		Integration Order
	Test Statistic	p-value	Test Statistic	p-value	
GDPG	-3.847**	0.028	-6.234***	0.000	I(0)
CAR	-2.134	0.234	-5.678***	0.000	I(1)
NPL	-1.987	0.291	-4.892***	0.001	I(1)
LIQ	-2.745*	0.073	-5.234***	0.000	I(1)

*Note: ***, *, and * denote rejection of unit root null hypothesis at 1%, 5%, and 10% significance levels, respectively. Test includes constant and trend terms. Critical values from MacKinnon (1996). Optimal length selected using Schwarz Information Criterion.

Long Run Coefficient Estimates

The ARDL model predicts long-run outcomes that indicate the equilibrium relationship between the growth of the economy and the stability of the banking sector. The capital adequacy ratio has a positive and significant coefficient (0.284) with a p-value (less than 0.05) indicating that other things held constant, one percentage change in the capital adequacy ratio corresponds to an increase in GDP growth by an amount of 0.28 percentage points. This great influence is mustered as per the findings of Linggadjaya et al. (2025) and shows the significance of capitalization in assisting the improvement of the economy. The mechanisms that support the relationship between CAR-growth are numerous. The increased capital adequacy helps banks to sustain shocks without reducing loans hence sustaining aggregate demand in the recession. Good capital implies financial stability, low financing costs and

Test of ARDL Bounds of Co-integration

Based on information criteria like AIC and SBC, the ARDL bounds testing procedure begins with the establishment of an optimal lag structure. After a comparison of the various models, it is decided to choose a specification ARDL(1,1,0,2) to indicate one lag of GDPG, one lag of CAR, no lags of NPL, and two lags of LIQ. Considering the limited number of observations (34), this parsimonious definition is a balance of the need to have a good fit and degrees of freedom considerations. The bounds test gives the squared significance of lagged level variables with the computed F-statistic of 6.847. The F-statistics is clearly above the upper limit when compared to the key value bounds of 5 percent significance level given by Pesaran et al. (2001) i.e. 3.79 (lower limit) and 4.85 (upper limit) of k=3 regressors. Thus, the repulsion of the null hypothesis of the absence of cointegration confirms the existence of a long-run-equilibrium relationship between the variables (Montenegro, 2019).

This cointegration outcome means that, despite the short-run fluctuations, the stability of the indicators of the banking sector and economic growth are correlated through a stable long-term relationship. Equilibrium is disrupted by temporary shocks that are absorbed in the process of adjustments that restore equilibrium in the long term. The outcome can guide policymakers to realize that more stability in the banking sector can have long-term positive impacts on the performance of the economy instead of immediate ones (see

enhances more efficient intermediation. It also allows the banks to finance long-term investments that are essential to sustained growth (Hu et al., 2022).

The NPL ratio shows that the growth of GDP decreases by approximately 0.15 percentage points with a one percentage point increase in the non-performing loans (coefficient = -0.146, which is below the level of 0.05). This negative association is aligned with the theoretical forecasts and previous empirical studies conducted by (Brunner & Schwengman, 2022). High NPLs limit capital and loaning ability of banks, increase tighter credit terms, escalate borrowing expenses and cause business to forget the focus in ordinary intermediation, therefore reducing growth. In addition, a decrease in systematic NPL is a sign of greater economic vulnerability in general, thus eroding corporate trust and investment (Syed & Aidyngul, 2022). The

positive value of the coefficient 0.092 ($p < 0.10$) of the liquidity ratio indicates that an increase in liquidity can help development though the effect is not statistically significant compared to CAR. An increase in the LIQ by one percentage point translates to a 0.09 percentage point increase in GDP growth. It might be because of trade-offs in terms of liquidity management: when liquidity is high enough, it ensures that the

credit persists in times of stress, but when liquidity is excessive, it means that the lenders miss opportunities to lend or make lower profits (Garg et al., 2024). The positive interceptive value captures independent growth contribution that is not explicitly modeled such as technological change, human capital formation and transformation processes that occur without the stability of the banking sector (see Table 4).

Table 4: ARDL Long-Run and Short-Run Coefficient Estimates.

Panel A: Long-Run Coefficients		
Variable	Coefficient	t-Statistic
CAR	0.284**	2.437
NPL	-0.146**	-2.182
LIQ	0.092*	1.789
Constant	2.134***	3.456
Panel B: Short-Run Coefficients		
Variable	Coefficient	t-Statistic
Δ CAR	0.167*	1.823
Δ NPL	-0.089	-1.234
Δ LIQ	0.123	1.456
Δ LIQ (-1)	-0.145*	-1.892
ECT (-1)	-0.418***	-3.892
Panel C: Diagnostic Tests		
Test	Test Statistic	p-value
Breusch-Godfrey Serial Correlation LM	1.834	0.176
Breusch-Pagan-Godfrey Heteroskedasticity	8.247	0.312
Jarque-Bera Normality	1.623	0.444
F-statistics (Bounds Test)	6.847***	-
Panel D: Model Selection Criteria		
Akaike Information Criterion		-3.456
Schwarz Bayesian Criterion		-2.987
Selected ARDL Model		(1,1,0,2)
Observations		34

*Note: ***, *, and * denote statistical significance at 1%, 5%, and 10% levels, respectively. ECT (-1) is the lagged error correction term. Δ denotes first difference operator. Critical values for bounds test at 5% significance: I (0) = 3.79, I (1) = 4.85.

Short-run Dynamics and Corrections of Errors

The ECM provides information on short-run adjustments. Having $p=0.01$, the coefficient of the error correction term is -0.418, which is negative and significant, hence indicating that approximately 42 percent of any deviation of long-run equilibrium is being corrected in a period of one year. This is a low rate of change compared to the high rates observed in other developing nations such as Nigeria where Agama (2024) recorded 71% convergence. The slower adaptation of Pakistani might be a pointer to structural inertia or late policy implementation or institutional constraints to the pace of transfer of finance to the real economy. Instant answers are captured in short-run coefficients. First-differenced NPL has a negative coefficient of -0.089 ($p > 0.10$) that is not significantly significant but as per the expected negative influence. The coefficient of first-differenced CAR is positive (0.167 ($p < 0.10$)) and it implies that growth in GDP in the short-run is influenced by marginal increases in capital adequacy, but to a smaller degree as compared to the long-run. This means that in accordance with Syed and Aidyngul (2022), NPL effects increase over time with decreasing quality of assets limiting borrowing and confidence. Liquidity is more complex in its dynamics. Although its second lag has a negative and slightly large coefficient, first-differentiated LIQ contemporaneous is positive and slightly large. This could imply high demand for

loans or high prudence, both of which are signs of an underlying weak economy, pointing to the ever-high liquidity, and urgent liquidity boosts lending. These nonlinear trends are consistent with what Mohindru (2023) observe regarding the complicated connection between liquidity and development.

Model Diagnostic Tests and Model Validation

Good diagnostic testing proves the reliability of this study's ARDL estimations. The BreuschGodfrey LM test reveals that there is no serial correlation (test = 1.834, $p=0.176$) and this indicates that the lag structure is appropriate to capture dynamic interactions. Breusch-Pagan-Godfrey heteroskedasticity test gives a value of 8.247 ($p=0.312$) which shows that the residual is homoskedastic and that the usual errors and inference test are being obeyed. The Jarque-Braun normality test ($z=1.623$, $p=0.444$) is consistent with the assumption of a normal distribution of residues and hence it enhances the precision and accuracy of the parameter estimates particularly in small samples. CUSUM test and CUSUMSQ tests indicate that the parameter remains stable; recursive residuals fall within 5% significance limits always. Pakistan has experienced a number of crises and policy reforms in the period 1990-2023; however, no structural break is observed. This stability implies that simple relationships between bank stability and economic growth remain unchanged regardless of whether the magnitude

of specific shocks may vary (Boachie, Aawaar, & Domeher, 2021). All these diagnostics collectively prove the strength and sufficiency of the ARDL model.

Comparison to Current Research

Results of this study are based on Pakistan-specific information, but in general, they do not contradict previous research. CAR-growth is positively related, as Poi et al. (2023) did, where major capital effects were found in developed countries, and Linggadjaya et al. (2025) emphasized the effects of capitalization in the Indonesian banks. This study's measure of elasticity is of a scale that corresponds to cross-country scales, which means the relationship between capital and growth in Pakistan is typical. In line with the findings of Kartal, Kirikkaleli and Ayhan (2023) in South Asia, the adverse relationship between the NPL and the growth. The value of the coefficient reveals that the bank-centric nature of the Pakistani financial system predisposes the development in particular to the quality of assets.

According to Beck et al. (2023), liquidity-growth results underline the role of liquidity in maintaining investment and growth. That the statistical significance of LIQ is lower than that of CAR is consistent with the results of Makhoba, Kaseeram and Greylig (2021) regarding asymmetric stability-growth dynamics. Finally, the ECM correction coefficient shows that there is a slight convergence in Pakistan, which is slower than the rapid rates in other developing economies as Nigeria is (Agama, 2024). Methodologically, the ARDL method proves that it can be used in other developing nations such as Nigeria (Haruna, Hassan, & Ahmad, 2022) and Ethiopia (Mazengia, Bezabih, & Chekol, 2023), thus highlighting the flexibility it has to mixed integration orders as observed in this study's unit root models.

Policy Recommendations and Conclusions

This study tests empirically the relationship between banking industry stability and economic growth in Pakistan using ARDL bounds testing framework by employing annual data between 1990 and 2023 (see Figure 2). The study examines three primary domains of banking stability, such as capital adequacy, asset quality, and liquidity, and analyzes their individual and combined impact on the actual GDP growth. In the course of nearly thirty years, the increased dataset helps the recording of the structural variations in the financial sector, policy variations, and macroeconomic occurrences in Pakistan to provide a comprehensive understanding of connections between stability and growth.

The results of this study are a number of interesting outcomes. Firstly, the results indicate a high long-run cointegrating effect between the indicators of the stability of the banking sector and economic growth, thus indicate that there are long-run equilibrium relationships between the two variables that remain consistent in short-term fluctuations. This finding highlights the enduring effects of health of the financial industry on macroeconomic outcomes. Second, capital

adequacy transforms into a significant and beneficial source of both short-term and long-term growth. Lenders with well-capitalized financial institutions are in a position to provide loans as they hold more cushions against shock therefore stimulating economic growth. Third, non-performing loans are a significant way of hindering growth hence the necessity of asset quality management of financial stability and economic development. High NPLs reduce lending power, increase the cost of finance and portray poor economic undertones, therefore, discouraging investment and consumption. Fourthly, liquidity control demonstrates promising yet quite insignificant impact on growth. Although too much liquidity may reduce lending efficiency thus suggesting a delicate balance between stability and optimum utilization of resources, sufficient liquidity benefits credit provision and banking operations during the period of uncertainty.

The error correction system exhibits moderate corrective dynamics with about 42 percent of the departures out of the long-run equilibrium being reverted in a year. Although it also indicates the continuation of shocks in the economy of Pakistan, this reflects the presence of corrective forces in the financial system. The soundness and consistency of the models are substantiated by thorough diagnostic tests, such as testing serial correlation, heteroskedasticity, normality and the stability of the parameters, which supports belief in these results.

The implications of these findings on policy are significant. To start with, the retention of proper capital reserves remains one of the primary areas of prudential control. Findings of this study justify the constant attempts of the State Bank of Pakistan to increase capital requirements as required by the Basel III standards. Nevertheless, excessive capital requirements can restrain access to credit; regulators need to adjust requirements in a way appropriate to address the stability-growth tradeoff (Bawuah, 2024). Second, the current high NPLs require a complex solution that encompasses a better credit risk management system, efficient loan recovery regulations, legislative and judicial reforms to accelerate NPLs settlement, and enhancement of corporate governance within banks. Even though new NPL management policies by the State Bank are positive steps, continuous implementation and control are of utmost importance (State Bank of Pakistan, 2024). Considering the negative effects of NPLs on growth found in this study, financial sector policy should give top priority to lowering NPLs.

Thirdly, adequate buffers should be guaranteed by liquidity management systems without unduly restricting lending activity. Under Basel III, the introduction of liquidity coverage ratio requirements provides ordered direction; however, regulators must modify these systems to Pakistan's particular banking and market conditions, namely deposit stability, interbank market depth, and central bank support mechanisms. Fourthly, it's clear the interaction between stability in the banking sector and the economy generally is. Sound financial, monetary, and structural policies provide ideal circumstances for banking sector health; while flaws in banks can spread to the

larger economy via credit shortages, financial instability, and fiscal costs of bank rescues. Integrated policy systems therefore have great importance. Furthermore, continuous banking sector changes like better governance, supervision, technical modernisation, and encouraging competition help with stability-centered rules and could promote sustainable growth. Though this study is mainly on asset quality, capital sufficiency, and liquidity, other projects including financial inclusion and efficiency upgrades would support these endeavors.

This research has flaws that point to avenues for more investigation. First, utilizing aggregate banking sector statistics might disguise diversity across institutions; bank-level panel studies could reveal subtler consequences. Second, while banking stability dimensions are accounted for, other factors such as institutional quality, human capital, infrastructure, and trade openness also influence growth and could be integrated in future studies. Third, the time-series focus restricts cross-country generalizability; comparative studies across South Asia could highlight regional trends. Finally, possible nonlinearities and threshold effects call for investigation as indicated by recent publications (Xu, 2025). Notwithstanding its drawbacks, the study offers strong proof that improving banking sector basics via enough capitalization, good asset quality, and wise liquidity management is vital not only for financial stability but also for sustained economic expansion in Pakistan. Future research should more thoroughly examine transmission routes to growth, distributive consequences of banking stability, interactions with monetary and fiscal policies, and effects of digital financial innovation to guarantee that policy actions stay evidence-based and successful in fostering inclusive, sustainable development.

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CRediT Authorship Contribution Statement

Zeeshan Rasool: Conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, writing original draft, project administration, resources, software, supervision, validation, visualization, writing review & editing.

Declaration of Competing Interest

The author declares no competing interests. He declares the absence of any relevant financial or non-financial conflicts of interest.

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Ethical Statement

This study adhered to ethical standards, and ethical approval was unnecessary as no human tissue or biological samples were used.

Data Availability Statement

Data is available on reasonable request for academic purposes only.

Artificial Intelligence/ Language Module Statement

The author confirms that no artificial intelligence or large language models (LLMs) were employed in the writing, analysis, or editing of this research, and he assumes full responsibility for its content.

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