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The Role of Bank Profitability and Liquidity in Indonesia's Economic Growth: An Empirical Study on ROA, LDR, and CAR

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ABSTRACT

This study analyzes the role of banking profitability and liquidity in influencing Indonesia's economic growth within a context of heightened macroeconomic volatility. While previous research has examined bank credit, assets, or profitability individually, empirical evidence remains limited regarding the simultaneous interaction between profitability and liquidity and their transmission to economic growth, particularly when external pressures such as inflation and exchange rate fluctuations are taken into account. This gap is critical for bank-based economies like Indonesia, where disturbances in liquidity and profitability rapidly affect intermediation capacity and real-sector performance. To address this gap, the study employs monthly data from 2018 to 2024 and applies a Vector Error Correction Model (VECM), complemented by Impulse Response Functions (IRF) and Forecast Error Variance Decomposition (FEVD). Banking performance is measured using Return on Assets (ROA), Loan to Deposit Ratio (LDR), and Capital Adequacy Ratio (CAR), while inflation and exchange rate serve as macroeconomic control variables. The results show that ROA, LDR, CAR, inflation, and the exchange rate significantly affect economic growth in both the short and long run, with profitability and liquidity variables exerting relatively stronger influences than macroeconomic factors. These findings provide evidence on how internal banking conditions interact with external shocks in shaping economic dynamics. The study offers implications for the design of macroprudential policies and contributes to the literature by integrating profitability and liquidity indicators within a unified empirical framework that accounts for macroeconomic instability

Keywords: *Economic Growth, Banking Sector, LDR, ROA, CAR, VECM, FEDV, Indonesia*

ABSTRAK

Penelitian ini menganalisis peran profitabilitas dan likuiditas perbankan dalam memengaruhi pertumbuhan ekonomi Indonesia dalam konteks volatilitas makroekonomi yang meningkat. Meskipun penelitian sebelumnya telah mengkaji kredit, aset, atau profitabilitas bank secara terpisah, bukti empiris masih terbatas mengenai interaksi simultan antara profitabilitas dan likuiditas serta transmisinya terhadap pertumbuhan ekonomi, khususnya ketika tekanan eksternal seperti inflasi dan fluktuasi nilai tukar turut diperhitungkan. Kesenjangan ini penting bagi negara dengan sistem keuangan berbasis perbankan seperti Indonesia, di mana gangguan pada likuiditas dan profitabilitas dengan cepat memengaruhi kapasitas intermediasi dan kinerja sektor riil. Untuk mengatasi kesenjangan tersebut, penelitian ini menggunakan data bulanan periode 2018–2024 dan menerapkan Vector Error Correction Model (VECM) yang dilengkapi dengan Impulse Response Functions (IRF) dan Forecast Error Variance Decomposition (FEVD). Kinerja perbankan diukur menggunakan Return on Assets (ROA), Loan to Deposit Ratio (LDR), dan Capital Adequacy Ratio (CAR), sementara inflasi dan nilai tukar digunakan sebagai variabel kontrol makroekonomi. Hasil penelitian menunjukkan bahwa ROA, LDR, CAR, inflasi, dan nilai tukar berpengaruh signifikan terhadap pertumbuhan ekonomi baik dalam jangka pendek maupun jangka panjang, dengan variabel profitabilitas dan likuiditas memberikan pengaruh yang relatif lebih kuat dibandingkan faktor makroekonomi. Temuan ini memberikan pemahaman mengenai bagaimana kondisi internal perbankan berinteraksi dengan guncangan eksternal dalam membentuk dinamika ekonomi. Penelitian ini memberikan implikasi bagi perumusan kebijakan makroprudensial dan berkontribusi pada literatur dengan mengintegrasikan indikator profitabilitas dan likuiditas dalam satu kerangka empiris yang mempertimbangkan ketidakstabilan makroekonomi.

Kata Kunci: *Pertumbuhan ekonomi, sektor perbankan, LDR, ROA, CAR, VECM, FEDV, Indonesia*

1. Introduction

Economic growth is one of the key indicators for assessing a country's progress. In this context, the role of the banking sector as one of the main pillars of the financial system has a significant influence on economic growth. Banking institutions not only function as financial intermediaries but also serve as key drivers of economic activity through efficient credit distribution and financial risk management (Konstantakopoulou, 2023). Bank profitability and liquidity are two critical

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aspects that determine the extent to which banks can contribute to economic growth. Profitability reflects a bank's ability to generate profit, while liquidity indicates its ability to meet short-term obligations. These two factors are interrelated and affect the stability of the financial system, which ultimately influences economic growth.

The stability of the banking sector is crucial for effective monetary policy transmission and resilience to macroeconomic shocks. In emerging economies like Indonesia, where the financial system is predominantly bank-based, disruptions in liquidity and profitability can quickly lead to credit contraction, reduced investment, and weaker real-sector performance. The COVID-19 pandemic illustrated this vulnerability, as risk aversion, tightening liquidity, and rising non-performing loans limited credit growth despite policy rate cuts. When liquidity weakens and profitability declines, monetary stimulus becomes less effective, banks reduce lending capacity, and economic growth slows. Thus, understanding the joint influence of liquidity and profitability is essential for safeguarding financial stability and supporting sustainable economic expansion, especially during periods of uncertainty.

In 2020, bank lending in Indonesia contracted by –2.41% amid exchange rate pressures and rising inflation. Yet, empirical evidence on how banks' profitability and liquidity responded to these conditions—and how these factors influenced economic growth—remains limited. This gap risks leading to monetary and financial policies that are not well aligned with prevailing macroeconomic dynamics.

Several previous studies have emphasized the importance of the banking sector in driving economic growth. Gil-Jardón et al. (2024) found that lending by commercial and development banks positively influences exports, GDP, and FDI in Mexico. Similarly, Murrar et al. (2024) showed that banks' financial strength, reflected in asset growth, positively affects economic performance in both the short and long term. Ismamudi et al. (2023) also highlighted the role of credit access, risk management, and financial governance in supporting economic development.

On the other hand, Klein and Weill (2022) demonstrated that banking profitability contributes positively to economic growth, although excessive profitability without adequate competition may generate inefficiencies and negative long-term outcomes. While these findings provide valuable insights, most studies still focus on single aspects—such as credit, assets, or profitability—without examining how profitability and liquidity jointly influence economic outcomes, particularly under external pressures such as inflation and exchange rate fluctuations.

Although several studies have separately analyzed the role of banking profitability or liquidity, research remains limited on how the two interact simultaneously in the presence of macroeconomic factors like inflation and exchange rates. Previous studies tend to overlook the combined effects of internal banking indicators and external variables, even though these factors substantially shape banking stability and broader economic growth. Therefore, a more comprehensive and integrative analytical approach is required to better understand how these interactions affect national economic performance.

The stability of the banking sector is crucial for effective monetary policy transmission and resilience to macroeconomic shocks. In emerging economies like Indonesia, where the financial system is predominantly bank-based, disruptions in liquidity and profitability can quickly lead to credit contraction, reduced investment, and weaker real-sector performance. The COVID-19 pandemic illustrated this vulnerability, as risk aversion, tightening liquidity, and rising non-performing loans limited credit growth despite policy rate cuts. When liquidity weakens and profitability declines, monetary stimulus becomes less effective, banks reduce lending capacity, and economic growth slows. Thus, understanding the joint influence of liquidity and profitability is essential for safeguarding financial stability and supporting sustainable economic expansion, especially during periods of uncertainty (World Bank, 2021).

Examining these dynamics is highly relevant for Indonesia, where financial authorities employ macroprudential tools—such as LDR adjustments, counter-cyclical capital buffers, and credit-easing incentives—to stabilize intermediation and support growth. However, empirical findings remain mixed on whether stronger liquidity or profitability consistently enhances economic growth, particularly under inflationary pressures and exchange rate volatility. This raises the question of whether improved banking indicators always strengthen growth transmission or instead reflect risk-averse behavior that limits credit expansion. Addressing this issue through an integrated analytical framework helps fill a key research gap and refine policy design so that improvements in banking performance translate into real economic activity rather than merely bolstering balance sheet (Lim et al., 2013).

In response to this research gap, the present study aims to analyze the role of bank profitability and liquidity in promoting economic growth. Referring to the study by Ferli et al., (2022), this research employs Return on Assets (ROA), Loan to Deposit Ratio (LDR), and Capital Adequacy Ratio (CAR) as proxies to measure bank profitability and liquidity. Additionally, the study includes exchange rate and inflation variables as control variables to account for external factors that may affect economic growth. By analyzing the relationships among these variables, this study is expected to contribute to a better understanding of the dynamic role of the banking sector in fostering economic growth and provide relevant policy recommendations for stakeholders.

2. Theoretical Basis

The role of the banking sector in supporting economic growth has long been a central focus in

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macroeconomic and development finance studies. Through its functions of intermediation, risk management, and capital allocation, banking performance directly and indirectly influences the productivity of the real sector. Nevertheless, the literature suggests that the sector's contribution to economic growth is not universal, but rather depends on the specific performance indicators analyzed (such as profitability, liquidity, and efficiency), as well as the institutional and policy context of each country.

The Role of Banking in Economic Growth

Coccorese (2024) examined the role of European Union structural funds in promoting economic growth across Italian provinces (NUTS 3) and found that regions with more developed local banking sectors experienced higher growth in value added. Using a panel regression approach and spatial panel models, the study demonstrated that the development of local banking systems amplifies the positive impact of structural funds on economic growth.

In the context of Mexico, Ramirez (2017) explored the relationship between bank credit and economic growth using the Vector Autoregressive (VAR) method. The results revealed that GDP growth had a positive influence on the expansion of bank credit, but no evidence was found for the reverse effect. This indicates that bank credit in Mexico tends to be reactive to economic growth rather than serving as a primary driver. Zeqiraj et al. (2020) investigated the impact of banking sector performance on economic growth in 13 Southeast European countries using the Generalized Method of Moments (GMM). The study found that banking efficiency has a positive and significant effect on economic growth. In addition, factors such as investment, human capital, and trade openness also positively contribute to economic growth.

Bank Profitability and Economic Growth

Numerous studies have also examined bank profitability and its impact on economic growth. Walid Ali et al. (2022) evaluated the effect of bank profitability on economic growth in six GCC countries using the Generalized Method of Moments (GMM). The results indicated that bank profitability has a positive impact on economic growth in both the short and long term, even after accounting for exchange rate and monetary policy factors.

Meanwhile, Mashamba et al. (2023) investigated the contribution of bank profitability to economic growth in 26 Sub-Saharan African (SSA) countries using the System GMM and Structural Equation Modeling (SEM) approaches. Their findings showed that bank profitability does not have a significant effect on economic growth in most SSA countries. However, in low-income countries, bank profitability positively contributes to economic growth, suggesting the dominant role of banks in economies with underdeveloped financial markets.

Liquidity and Economic Growth

Sayedi & Ringim (2018) examined the impact of bank liquidity on economic growth in Nigeria from 1981 to 2014 and found that bank reserves had a positive and significant effect, while the LDR had a negative impact. However, the liquidity ratio itself was not statistically significant. They recommended increasing bank reserves at the Central Bank of Nigeria as well as improving the loan-to-deposit ratio to stimulate economic growth. Meanwhile, Jumono et al. (2021) investigated the relationship between banking liquidity and economic development in underdeveloped regions of Nusa Tenggara, Indonesia, using VAR/VECM methods. The results showed that liquidity had a positive impact on inflation, but its effect on economic growth differed between West and East Nusa Tenggara. Increased household savings were identified as a key factor in improving regional economic performance. Both studies highlight the important role of bank liquidity in driving economic growth, although with differing findings and recommendations based on each country’s context.

Banking Efficiency and Stability

Mtir & Abdallah (2020) analyzed banking efficiency in Tunisia using the Data Envelopment Analysis (DEA) and Error Correction Model (ECM) approaches. Their study found that highly efficient banks, such as Amen Bank and Arab Tunisian Bank, contributed more significantly to the national banking system. Profitability variables such as ROA and ROE were also found to have a positive impact on banking performance.

In the context of Nigeria, Bernard Azolibe (2022) employed the Dynamic Ordinary Least Squares (DOLS) and ECM methods to examine the relationship between banking intermediation development and economic growth. The study found that an increase in the number of bank branches and total bank assets had a significant positive effect on short-term economic growth. This underscores the importance of expanding banking networks and strengthening bank assets in supporting sustainable economic development.

Banking Regulation and Economic Stability

Hamdaoui & Cancelo (2024) investigated the role of the banking sector in economic growth and commodity prices in Spain, France, and Romania. The study found a positive correlation between the strength of the banking sector and economic growth, while also emphasizing the importance of regulation in maintaining financial stability. Credit risk management, lending policies, and liquidity were identified as critical factors in ensuring the sustainability of the banking system.

In India, Reddy et al. (2023) and Alam et al. (2021) explored the relationship between banking performance and economic growth. Reddy et al. found that variables such as domestic credit, ROE, and CAR had positive correlations with GDP growth. Meanwhile, Alam et al. found that interest margins and ROA contributed positively to economic growth, although bank lending

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and investment capacity showed no significant relationship with GDP growth. These findings suggest that while banking plays an important role, specific elements—such as investment capacity—need to be enhanced to fully optimize its contribution to economic development.

In the Indonesian context, several empirical studies also emphasize the importance of internal banking indicators in shaping financial performance. (Ekananda, Jamiyla, and Pratiwi (2016) found that Capital Adequacy Ratio (CAR) and Loan to Deposit Ratio (LDR) significantly influence Return on Assets (ROA) in Indonesian commercial banks included in the LQ45 index, indicating that liquidity and capital strength play key roles in shaping bank profitability. Similarly, Armereo (2015) highlighted that variables such as CAR and LDR significantly affect profitability in Indonesian Islamic banks, reinforcing that liquidity management and capital resilience remain critical determinants of banking performance. Although these studies do not directly measure economic growth, they provide strong micro-level evidence that core banking indicators—especially LDR, CAR, and profitability (ROA)—serve as foundational transmission channels through which the banking sector can support broader economic activity. These findings support the inclusion of ROA, LDR, and CAR as key variables in assessing banking sector contributions to economic growth in Indonesia.

Implications for This Study

Based on the literature review presented above, it can be concluded that the relationship between banking sector performance and economic growth is complex and highly contextual. Various studies have shown that indicators such as profitability, liquidity, efficiency, and banking stability can positively contribute to economic growth. However, these effects are strongly influenced by structural factors such as the level of financial sector development, monetary and fiscal policies, and each country's institutional conditions. Moreover, the diversity of empirical findings across countries and regions indicates that there is no universal consensus on which banking performance indicators are most critical for driving economic growth.

While numerous studies have examined profitability and liquidity separately, research that integrates both within a single analytical framework—especially one that accounts for macroeconomic control variables such as exchange rates and inflation—remains relatively limited, particularly in developing countries. Therefore, this study aims to fill this gap by analyzing how bank profitability and liquidity affect economic growth in a more integrated context. The findings are expected to enrich the existing literature and offer relevant policy insights for strengthening both the banking sector and the broader economy.

3. Methodology

This study adopts a quantitative research approach to examine the impact of the banking sector on Indonesia's economic growth. The analysis aims to identify both short-run and long-run relationships between banking profitability and liquidity and economic growth, while incorporating macroeconomic variables as controls.

3.1 Data

The study utilizes monthly time-series data covering the period from January 2018 to March 2024. All data are obtained from secondary sources, namely the Indonesia Banking Statistics published by the Financial Services Authority (Otoritas Jasa Keuangan) and from Bank Indonesia. Banking sector performance is represented by three main indicators: Return on Assets (ROA), Loan to Deposit Ratio (LDR), and Capital Adequacy Ratio (CAR) as proxies for profitability and liquidity. Two macroeconomic variables—exchange rate and inflation—are included as control variables to capture the influence of external economic factors on Indonesia's economic growth.

3.2 Analytical Method

The analytical tool used in this research is the Vector Error Correction Model (VECM). This method is applied to analyze both long-run and short-run relationships (Brooks, 2019). VECM is chosen because it can handle variables that exhibit cointegration, thus allowing for a more accurate distinction between long-term and short-term effects.

In general, the VECM model can be represented as follows:

$$\Delta Y_t = \alpha + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-1} + \Pi Y_{t-1} + \varepsilon_t$$

where:

Y_t = Vector of variables in the system (Economic Growth, ROA, LDR, CAR, Inflation, Exchange Rate)
Δ = First difference operator
r_i = Short-run coefficient matrices
= Long-run relationship matrix (cointegration matrix)
ε_t = Residual or error term

In addition to the VECM analysis, this study also employs Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD). IRF is used to measure the response of a particular variable to a shock in another variable within the system, while FEVD is applied to determine the relative contribution of each independent variable in explaining the variation in economic growth. The combination of these three approaches is expected to provide a more comprehensive understanding of the dynamic relationship between the banking sector and economic growth.

Although VECM, IRF, and FEVD are appropriate methods for analyzing the dynamic interactions among variables, several methodological limitations should be noted. First, the model heavily relies on the assumptions of stationarity and cointegration, which have been tested

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and satisfied in this study. Second, the use of monthly data tends to be more sensitive to short-term fluctuations and may not fully capture long-term structural changes. Third, all variables used in this study are quantitative, thereby not accounting for qualitative factors such as market perceptions, risk management practices, or geopolitical conditions, which may also influence economic growth.

4. Results and Discussion

Unit Root Tests

Table 1 below presents the results of the unit root test using the Augmented Dickey-Fuller (ADF) method. The test results indicate that all variables used in this study are stationary at first difference.

Table 1. Augmented Dickey-Fuller (ADF)

Variable	ADF Stats	Critical Value 1%
Economic Growth	-5.326	-3.559
ROA	-11.57	-3.559
CAR	-6.286	-3.559
LDR	-6.396	-3.559
Exchange rate	-9.212	-3.559
Inflation	-6.799	-3.559

Source: Stata Output

The ADF test statistic value for Economic Growth (-5.326) is lower than the critical value (-3.559) at the 1% significance level, indicating that the variable is stationary at first difference. Similarly, the other variables—ROA, CAR, LDR, Exchange Rate, and Inflation—also have ADF test statistic values lower than their respective critical values. Therefore, it can be concluded that all variables used in this study are stationary at first difference.

Cointegration Test

After conducting the unit root test, a cointegration test was also performed to identify whether a long-run equilibrium relationship exists among the variables.

Table 2. Cointegration Test

Rank	Trace Statistic	5% Critical Value	Conclusion
0	283.9327	94.15	cointegrated
1	184.0011	68.52	cointegrated
2	127.0088	47.21	cointegrated
3	80.7037	29.68	cointegrated
4	44.7047	15.41	cointegrated
5	16.0067	3.76	cointegrated
6	-	-	-

Source: Stata Output

The cointegration test results presented in Table 2 indicate the presence of cointegration relationships in the research model. From rank 0 to rank 5, the Trace Statistic values exceed the 5% critical values, leading to the rejection of the null hypothesis (H_0) of no cointegration. Therefore, cointegration exists at each level from rank 0 to rank 5. These results suggest that the variables in the model share a strong long-run equilibrium relationship.

VECM Estimation

Table 3 presents the short-run estimation results of the Vector Error Correction Model (VECM) using three key indicators: Chi-squared (Chi^2), P-value, and R-squared.

Table 3. Short-Run VECM Estimation Results

Dependent variable	Chi2	P-value	R-square
Economic Growth	43.089	0.000	0.4531
ROA	130.452	0.000	0.7150
CAR	54.185	0.000	0.5103
LDR	51.868	0.000	0.4994
Exchange rate	90.370	0.000	0.6348
Inflation	50.619	0.000	0.4933

Source: Stata Output

The short-run results in Table 3 indicate that all VECM equations are statistically significant at the 1% level, suggesting strong short-run interactions among the variables. This finding is consistent with the modern bank lending channel, where changes in bank conditions quickly transmit to the real economy through adjustments in credit supply (Gambacorta & Shin, 2018).

The relatively high short-run responsiveness of ROA ($R^2 = 0.7150$) and the exchange rate ($R^2 = 0.6348$) supports the view that banks rapidly adjust profitability and balance-sheet positions when facing macro-financial shocks, a mechanism emphasized in recent macro-financial literature (Adrian et al., 2019).

For economic growth, the R^2 of 0.4531 indicates that nearly half of short-run growth fluctuations can be attributed to ROA, LDR, CAR, inflation, and exchange rate movements. This aligns with evidence that in bank-dependent economies, financial-sector shocks translate quickly into real sector activity (Cecchetti & Kharroubi, 2012).

Table 4. Long-Run VECM Estimation Results

Variable Dependent	ECT Coefficient	P-value
Economic Growth	-0.4345	0.001
ROA	0.0680	0.008
CAR	0.0417	0.624
DR	0.5419	0.001
Exchange rate	-6.4800	0.920
Inflation	0.0011	0.067

Source: Stata Output

The negative and significant Error Correction Term for economic growth (–0.4345, $p = 0.001$) shows that deviations from long-run equilibrium adjust gradually. This supports the contemporary understanding that financial and real-sector variables exhibit stable long-run cointegration in emerging markets, especially when financial intermediation is dominant (Adrian et al., 2019).

The strong long-run effect of LDR (0.5419; $p = 0.001$) is aligned with recent findings that effective credit intermediation stimulates productive investment and long-term growth (Cecchetti & Kharroubi, 2012). A higher LDR reflects active credit allocation, which enhances capital accumulation and reinforces growth momentum.

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Similarly, the significant long-run effect of ROA (p = 0.008) supports the argument that profitable banks are better positioned to absorb risks, expand credit, and sustain economic activity, consistent with the risk-bearing capacity perspective in modern banking theory (Adrian et al., 2019).

In contrast, CAR is not significant in the long run, which aligns with the risk-taking channel (Borio & Zhu, 2012). Banks with higher capital ratios may operate more conservatively, limiting long-run credit expansion and muting their contribution to sustained growth.

The exchange rate also shows no long-run significance, consistent with IMF (2015) evidence that exchange rate shocks primarily affect economies in the short run through price adjustments, while long-run effects dissipate as financial markets adapt and policy buffers absorb external pressures.

Overall, the long-run results highlight that Indonesia's growth trajectory is more strongly driven by intermediation capacity (LDR) and profitability (ROA) than by prudential capital buffers (CAR) or external macro variables, which exert more transient effects.

Impulse Response Function (IRF)

The Impulse Response Function (IRF) is illustrated in Figure below:

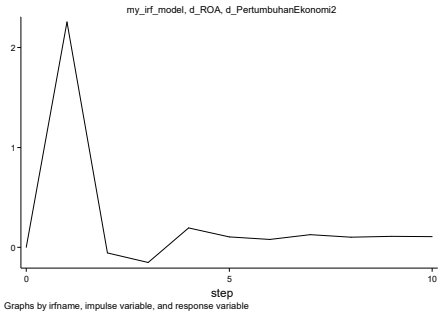

Figure 1. Economic Growth Response to ROA Shock

ROA exerts a pronounced and immediate positive shock on economic growth, consistent with modern financial intermediation theory as described in contemporary banking literature. Profitability strengthens banks' capacity to lend and allocate credit efficiently, in line with principles laid out in banking risk-management frameworks. The sharp initial response in the impulse response function aligns with theories from balance-sheet-oriented banking models, which suggest that banks translate profitability gains quickly into real sector lending (Choudhry, 2022).

However, the effect diminishes rapidly in subsequent periods, indicating that the initial shock is not fully persistent. The decline following the first period may reflect market corrections, adjustment frictions, or the tendency of profitability improvements to stimulate short-lived balance-sheet effects rather than sustained expansion in productive investment. After the fourth period, the response trajectory converges toward a steady state at a much lower intensity, signaling that profitability alone is insufficient to sustain long-run economic acceleration without support from other structural or macroeconomic conditions.

This temporal pattern aligns with the concept that bank profitability acts primarily as a short-term growth catalyst rather than a long-term growth determinant. The result corroborates Albania et al. (2025), who reported a similarly strong early-period response of economic growth to ROA shocks in Indonesian Islamic banks, followed by a gradual dissipation over time. Collectively, these findings highlight that while profitability strengthens the banking sector's immediate contribution to economic momentum, its effects may not endure unless accompanied by persistent improvements in credit quality, intermediation depth, and overall financial stability.

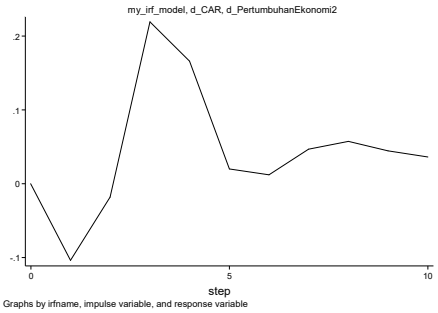

Figure 2. Economic Growth Response to CAR Shock

The impulse response function indicates that CAR initially generates a short-term negative shock to economic growth, as observed in the first period. This early contractionary response may reflect the cost of capital adjustment, where banks strengthen their capital buffers by retaining earnings or limiting credit disbursement. In the short run, such balance-sheet consolidation can temporarily restrict the banking sector's lending capacity, reduce liquidity in the real sector, and slow economic activity.

This pattern reflects the general tendency in banking systems where capital strengthening initially limits lending capacity but later enhances resilience and risk-bearing ability. Once capital buffers are rebuilt, banks are better positioned to support credit expansion, allowing the positive effects on growth to materialize (Berger & Bouwman, 2013).

From the second period onward, the effect reverses and becomes positive, reaching its highest point around the third period. This shift signals a transmission lag typical of capital-based regulatory adjustments, where higher capitalization initially constrains credit, but later enhances financial stability, increases market confidence, and expands the banking sector's capacity to absorb risk. During this phase, well-capitalized banks are better positioned to extend credit sustainably, support business expansion, and stimulate investment—key drivers of economic growth.

After the third period, the response exhibits moderate fluctuations before stabilizing, suggesting that CAR shocks converge toward equilibrium as markets

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absorb the initial adjustment and the banking system recalibrates lending behavior. The eventual stabilization further implies that while CAR is not an immediate growth accelerator, it plays a medium-term stabilizing and growth-supporting role, reinforcing resilience rather than producing instant output expansion.

These dynamics are in line with Bawuah (2024), who finds that a higher capital adequacy ratio strengthens the stability–growth nexus in Sub-Saharan Africa. According to the study, well-capitalized banks are more resilient to external shocks, better equipped to absorb risks, and more capable of sustaining credit flows during periods of volatility, thereby fostering a stable financial environment that supports long-term economic expansion.

Overall, the IRF response suggests that CAR functions less as a short-run growth engine and more as a medium-term growth enabler, where its initial restraining effect gives way to enhanced financial stability and economic support once capital adjustments are completed.

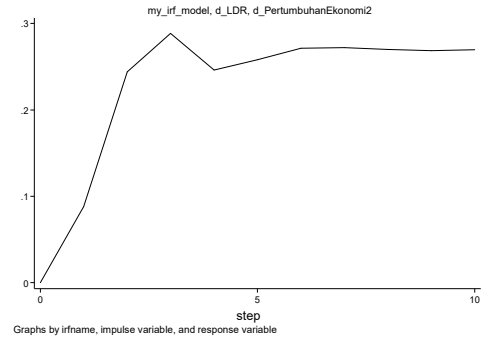

Figure 3. Economic Growth Response to LDR Shock

The impulse response results show that LDR delivers an immediate and sustained positive shock to economic growth, with the strongest response occurring in the early periods and peaking around the third period. This indicates that an increase in LDR—which represents a higher proportion of bank lending relative to third-party deposits—rapidly stimulates real economic activity, primarily through expanded credit supply to firms and households. The pronounced short-to-medium term effect suggests that credit intermediation plays a central role in driving aggregate demand, investment, and production capacity during initial expansion phases.

Beyond the third period, the response remains positive but gradually converges toward a stable path, implying that while credit expansion continues to support growth, its marginal impact declines over time as markets adjust toward equilibrium. This pattern reflects a typical credit-transmission dynamic, where bank lending creates a front-loaded growth impulse, but its long-run effect becomes more incremental rather than explosive, consistent with the maturing absorption capacity of the real sector and the natural limits of credit-driven expansion.

This pattern is consistent with the traditional bank-lending channel of monetary transmission, which explains that increases in bank credit generate an immediate stimulus to aggregate demand, while their long-run effects gradually diminish as the economy adjusts toward its potential output (Mishkin, 2018).

The persistent positive trajectory also signals that credit growth under stable funding conditions does not generate destabilizing corrections, suggesting that Indonesia's banking intermediation remains growth-supportive even at higher LDR levels, provided liquidity risk remains manageable. This reinforces the view that LDR functions not only as a credit supply indicator but also as a proxy for financial depth and intermediation efficiency.

These findings are consistent with Adeyemi-Tijani (2025), who, using VAR and IRF for the Nigerian economy, emphasizes that credit availability—proxied by LDR—plays a decisive role in stimulating GDP, particularly in the short and medium horizons. They are also aligned with Klein & Weill (2018), whose panel data evidence shows that higher LDR ratios, when reflective of deeper financial intermediation rather than liquidity pressure, positively influence real output over time.

Overall, the IRF pattern confirms that LDR is a short-to-medium term growth accelerator and a long-term growth stabilizer, underscoring the importance of maintaining an optimal credit-deposit balance to support economic expansion without inducing funding vulnerabilities.

Figure 4. Economic Growth Response to Exchange rate Shock

The exchange rate shock exhibits a pronounced negative response in the initial periods, indicating that currency depreciation and short-term exchange rate volatility can disrupt economic performance. This early contractionary effect may occur through several channels, including rising costs of imported inputs, inflationary pressures, weakened investor confidence, and increased uncertainty in international trade and capital flows. Although the response gradually improves in subsequent periods, the initial downturn highlights the economy's vulnerability to short-run external shocks and adjustment frictions. The gradual recovery suggests that markets eventually absorb the shock through real exchange rate adjustments, trade rebalancing, or monetary policy responses, but not without short-term output costs.

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Similarly, inflation demonstrates a steep negative reaction in the early periods, confirming its adverse impact on economic growth. High inflation erodes purchasing power, reduces real returns on investment, increases production costs, and often prompts monetary tightening, all of which can suppress aggregate demand and productive activity. The IRF trajectory shows that inflation remains subdued in the long run, indicating that once price stability is restored, its drag on output diminishes. However, the persistent low response in later periods implies that inflation does not contribute positively to growth at any horizon, reinforcing its role as a growth-suppressing macroeconomic force rather than a growth driver.

These response patterns align with established macroeconomic theory, which states that exchange rate depreciation and rising inflation impose short-run contractionary effects by reducing real income, increasing production costs, and creating uncertainty that weakens investment and trade flows. Standard frameworks such as the Mundell–Fleming model explain how currency volatility and inflationary pressures can suppress output in open economies, particularly when capital mobility amplifies external shocks (Krugman, Obstfeld & Melitz, 2018). Likewise, inflation's negative impact is consistent with classical and modern monetary theory, which emphasizes that price instability distorts resource allocation and constrains economic activity until macroeconomic adjustment restores equilibrium (N. Gregory Mankiw, 2024).

Together, these findings suggest that macroeconomic instability—whether originating from exchange rate volatility or inflationary surges—imposes immediate and economically meaningful constraints on growth, even if recovery mechanisms gradually mitigate their effects. The results emphasize the importance of maintaining exchange rate stability and price control as preconditions for sustained economic expansion, especially in economies where financial transmission mechanisms remain sensitive to external and nominal shocks.

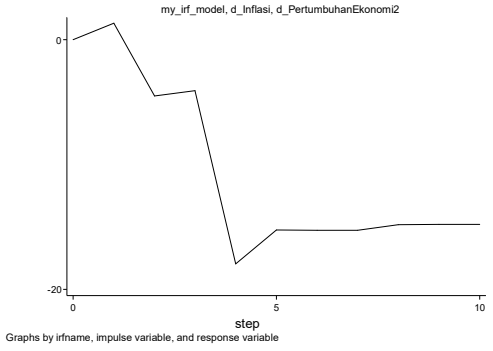

Figure 5. Economic Growth Response to Inflation Shock

Based on the results of the VECM and IRF analysis, it can be concluded that ROA, LDR, CAR, inflation, and exchange rate influence economic growth both in the short and long term. From the impulse response function (IRF) results, ROA exhibits an initial sharp increase in economic growth before stabilizing, indicating a strong short-term positive effect that diminishes over time. CAR shows an initial negative response that turns positive, reflecting an indirect and delayed effect on economic growth. LDR produces a positive and sustained impact in the long run, suggesting that an increase in LDR contributes to economic growth. In conclusion, the results highlight the importance of maintaining financial and macroeconomic stability to support sustainable economic growth.

Variance Decomposition

The Forecast Error Variance Decomposition is illustrated in table below:

Table 5. Forecast Error Variance Decomposition (FEVD) Analysis Results

Economic Growth	ROA	CAR	LDR	Exchange rate	Inflation
0.000	0.000	0.000	0.000	0.000	0.000
1.000	0.000	0.000	0.000	0.000	0.000
0.833	0.096	0.015	0.031	0.025	0.00034
0.761	0.080	0.013	0.072	0.075	0.00028
0.707	0.071	0.018	0.119	0.085	0.00028
0.679	0.065	0.023	0.149	0.082	0.00130
0.656	0.061	0.022	0.178	0.080	0.00144
0.631	0.057	0.021	0.209	0.081	0.00153
0.609	0.053	0.020	0.236	0.080	0.00162
0.591	0.050	0.019	0.259	0.079	0.00168
0.574	0.048	0.019	0.279	0.078	0.00173

Source: Stata Output

The results of the Forecast Error Variance Decomposition (FEVD) analysis provide a comprehensive overview of the relative contributions of each variable to the forecast error variance of economic growth over the short to long term.

The FEVD dynamics align with macro-financial frameworks suggesting that, over extended horizons, fluctuations in output are increasingly shaped by structural financial conditions rather than short-run nominal movements. In established monetary and banking theory, the depth of credit intermediation and the strength of bank balance sheets become progressively more influential because they determine the economy's ability to fund investment, absorb shocks, and maintain liquidity across time (Mishkin, 2018). Conversely, variables such as inflation and the exchange rate typically account for a smaller share of long-term variance, as their effects tend to be front-loaded and rapidly corrected through policy adjustments and market mechanisms. Consequently, long-horizon variance decomposition naturally highlights the central role of financial intermediation in shaping the trajectory of economic growth.

In the initial period (step 1), 100% of the variation in the forecast error of economic growth is explained solely by its own innovations. This is a typical outcome, as the immediate response tends to be dominated by the variable itself before the effects of other variables are incorporated into the model.

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As the time horizon extends, however, the influence of other variables gradually increases. LDR emerges as the most influential external factor affecting economic growth in the medium to long term. Its contribution rises from 3.1% in step 2 to 27.90% by step 10, making it the largest non-autonomous contributor to the variation in economic growth. The prominent role of LDR in explaining economic growth aligns with recent empirical evidence supporting bank intermediation as a catalyst for GDP expansion (Gadisa and Tigre, 2022; *et al.*, 2022). Additionally, bank-specific dynamics such as deposit mobilization and balance sheet structure—factors captured by LDR—have been shown to significantly influence credit supply

The ROA also demonstrates a notable influence at the early stage of the forecast period, contributing 9.6% at step 2. However, its impact declines progressively, reaching 4.80% at step 10, suggesting that ROA plays a more significant role in the short term. The observed influence of ROA on economic growth aligns with findings by Klein and Weill (2022), who report significant positive effects of bank profitability on economic expansion in both the short and long run. Similarly, empirical work using a CAMELS framework (Ledhem & Mekidiche, 2020) supports ROA's significant (though marginal) positive relationship with GDP growth. These sources reinforce the validity of our FEVD results, where ROA emerges as a key financial determinant explaining the variability in economic growth.

The CAR and the exchange rate exhibit relatively small but consistent contributions throughout the period. By step 10, CAR accounts for 1.90% and the exchange rate for 7.80% of the forecast error variance in economic growth. This indicates that while their effects are limited in magnitude, they remain relevant in shaping economic dynamics.

In contrast, inflation has a minimal and almost negligible impact across all forecast horizons, with a maximum contribution of only about 0.17%. This suggests that, within the context of the model and time period analyzed, inflation does not appear to be a dominant factor influencing economic growth.

Taken together, the FEVD results underscore the predominant role of banking sector variables, particularly LDR and ROA, in explaining fluctuations in economic growth relative to traditional macroeconomic indicators. The escalating contribution of LDR over time signals that credit channel stability and intermediation capacity serve as key structural drivers of growth, rather than merely cyclical corporate profitability or short-run macroeconomic conditions. This indicates that economic growth in Indonesia is highly responsive to banking system liquidity deployment, where the availability and sustainability of loan financing matter more than external price shocks or nominal volatility.

The declining contribution of ROA over the forecast horizon suggests a temporal distinction between profitability and credit transmission mechanisms. Profitability strengthens initial banking resilience and credit origination capacity, but its diminishing share in later periods confirms that operational performance alone does not sustain long-horizon output growth without continued credit expansion, as captured by the rising dominance of LDR (World Bank, 2021). Together, this highlights the complementary yet distinct roles of profitability and liquidity: ROA acts as a short-term growth enabler, while LDR emerges as the long-term transmission backbone of economic expansion.

The relatively stable but modest contributions of CAR and the exchange rate imply that while capital buffers and external competitiveness matter, their effects are more supportive than catalytic (Berger & Bouwman, 2013). CAR's limited yet stable share reflects its role as a risk-absorbing stabilizer, ensuring lending continuity rather than aggressively driving output. Meanwhile, the exchange rate contribution, though larger than CAR's, remains secondary compared to domestic credit dynamics, implying that Indonesia's growth volatility is more credit-sensitive than exchange-rate sensitive within the analyzed period (Aghion et al., 2009).

Furthermore, the near-zero inflation contribution provides important structural insight. Despite inflation showing contractionary effects in the IRF, the FEVD confirms that inflation shocks do not meaningfully explain output fluctuations in the forecast horizon. This suggests that inflation during the study period was either well-anchored, effectively sterilized by policy instruments, or dominated by supply-side components that did not materially disrupt output trajectories (World Bank, 2021a). Consequently, Indonesia's growth variance appears more determined by financial intermediation conditions than price-level volatility.

Overall, the FEVD findings point to a clear narrative: economic growth dynamics in Indonesia over 2018–2024 are primarily shaped by the banking sector—particularly liquidity provision through credit (LDR), followed by short-term profitability effects (ROA), while macroeconomic shocks play a comparatively smaller role. These results reinforce the policy relevance of maintaining efficient, well-capitalized, and credit-supportive banking operations to sustain economic momentum.

5. Conclusion

This study demonstrates that banking-sector indicators—particularly the Loan-to-Deposit Ratio (LDR) and Return on Assets (ROA)—play a more influential role in driving Indonesia's economic growth than macroeconomic variables such as inflation and the exchange rate. The VECM results confirm a stable long-run cointegration relationship, indicating that financial intermediation and macroeconomic stability jointly shape output dynamics over time.

In the short run, LDR and ROA emerge as the strongest determinants of growth. This pattern aligns with the bank-lending channel framework, which posits that banks with stronger liquidity positions and higher profitability adjust lending more aggressively in response to economic conditions (Gambacorta &

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Marques-Ibanez, 2011). Meanwhile, CAR, inflation, and the exchange rate exert weaker short-term influences, suggesting that capital buffers and external shocks affect growth more indirectly.

In the long run, FEVD results show that economic growth is largely driven by its own past performance, while LDR becomes the most important external contributor. This supports the view that sustained intermediation capacity is essential for long-term economic expansion, consistent with empirical findings that credit supply and bank liquidity significantly shape macroeconomic performance over time (Bruno & Shin, 2015). ROA also contributes to long-run growth, though its influence gradually declines, reflecting that profitability matters more for enabling intermediation than for maintaining persistent output growth (Klein & Weill, 2022).

Overall, the results show that Indonesia's economic growth is more sensitive to banking-sector dynamics than to macroeconomic price movements. Strengthening the quality and sustainability of credit intermediation, maintaining balanced liquidity–profitability management, and supporting an efficient lending channel are therefore critical policy priorities. Growth-oriented financial strategies should complement macroeconomic stabilization tools with targeted measures that reinforce bank resilience and enhance productive credit allocation—ensuring that improvements in banking performance translate into real-sector expansion.

Research Implications

The findings of this study offer substantial implications for both policy practitioners and academic discourse. From a practical standpoint, the strong influence of LDR and ROA indicates that Indonesia's economic growth is closely linked to the banking sector's capacity to intermediate deposits into productive credit and to generate profit efficiently from financial assets. These findings imply that banking policy should not merely promote credit expansion, but must also ensure efficient loan allocation toward growth-enhancing sectors, sound risk pricing, and digital-driven operational efficiency. Strengthening loan absorption capacity in strategic industries, paired with prudent risk monitoring, would amplify the growth impact while minimizing financial fragility. Thus, policies that enhance intermediation quality—rather than quantity alone—will have more sustainable effects on real economic output.

From a regulatory perspective, the results underline the importance of designing dynamic, countercyclical macroprudential policies. Since liquidity (LDR) and profitability (ROA) exhibit a stronger growth effect than capital buffers (CAR) or macroeconomic variables, regulators may consider flexible policy instruments that encourage credit expansion during downturns and reinforce capital resilience during upturns. This supports a shift from static compliance-driven supervision toward adaptive, risk-sensitive regulatory frameworks, enabling banks to act as growth stabilizers instead of shock amplifiers.

Academically, this study contributes to banking–growth literature by jointly modeling profitability, liquidity, and key macroeconomic controls within a dynamic VECM-based framework—an integration that remains relatively limited in empirical studies within emerging markets. Future research could extend this by incorporating bank heterogeneity analysis (e.g., state-owned vs private banks, conventional vs Islamic banks), credit quality transmission channels (e.g., NPL, credit risk pricing), and financial cycle interactions to further unpack the mechanism linking financial intermediation and real economic activity. Moreover, expanding the scope into cross-country panel models, regime-switching VAR, or non-linear macro-financial modeling could capture structural differences and conditional effects under crisis and non-crisis regimes.

Additionally, given the increasing role of fintech lending, digital banking, and alternative credit channels in Indonesia, future studies may also explore the interaction between digital financial deepening and traditional bank intermediation to evaluate whether technological transformation complements or substitutes the banking-growth nexus identified in this study. These extensions would provide more granular insights into evolving financial ecosystems and their implications for long-term economic growth.

Policy Recommendations

Based on the findings regarding the role of banking performance in Indonesia's economic growth, several policy recommendations can be considered:

Enhance Bank Profitability (ROA) to Support Economic Growth

The study finds that ROA significantly influences economic growth, reflecting banking efficiency in generating profit from its assets. Therefore, banks should improve their efficiency by minimizing credit risk, optimizing loan disbursement to productive sectors, and enhancing digital banking services to reduce operational costs.

Optimize Credit Distribution (LDR) for Greater Productivity

The LDR plays a dominant role in influencing economic growth, indicating that a higher credit-to-deposit ratio corresponds to greater banking sector contribution to the economy. However, LDR improvements must be accompanied by prudent credit quality management to avoid increasing non-performing loans. The government and financial authorities should promote selective and productive credit policies, particularly in high-impact sectors such as manufacturing, MSMEs, and infrastructure.

Strengthen Bank Capital (CAR) for Financial Stability

The CAR represents the capital strength of banks, which is vital for maintaining financial system stability.

Although CAR has a smaller impact compared to ROA and LDR in this study, banks must still maintain sound capital adequacy to withstand systemic risks and ensure long-term resilience. The Financial Services Authority (OJK) should continue reinforcing capital regulation to safeguard financial system stability.

Manage External Risks: Exchange Rate and Inflation

The findings show that exchange rate and inflation fluctuations affect economic growth, albeit to a lesser extent than banking factors. Therefore, Bank Indonesia must continue to maintain exchange rate and inflation stability through effective monetary policy, such as intervening in the foreign exchange market when necessary, and adjusting interest rates appropriately to avoid hindering credit growth.

Strengthen Collaboration between the Government, Bank Indonesia, and the Banking Sector

A stronger collaboration between the government, Bank Indonesia, and the banking sector is essential to optimizing the banking system's role in economic growth. The government can provide incentives for credit directed to priority sectors, while Bank Indonesia maintains monetary policies that support stability. Beyond expanding credit volume, long-term growth requires structural strengthening of financial intermediation—improving credit quality, enhancing credit-scoring systems, supervising digital lending, and aligning macroprudential tools with development objectives. Authorities should also develop an early warning system that monitors profitability, liquidity, and capital in stress scenarios. Given the strong influence of ROA and LDR and the stabilizing role of CAR, adopting a dynamic, countercyclical regulatory framework will help ensure that banks act as growth amplifiers rather than shock transmitters during periods of economic volatility.

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