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THE EFFECTS OF MACROPRUDENTIAL POLICIES ON THE PERFORMANCE OF CONVENTIONAL BANKS IN INDONESIA

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ABSTRACT

A resilient banking system in Indonesia is essential to withstand economic fluctuations that have significantly impacted Indonesia, especially during financial crises. To address these challenges, effective macroprudential policies are required to support the development of a high-performance banking sector. This research examines the impact of macroprudential policies on the performance of conventional banks in Indonesia. The research uses time-series data from 2014 to 2023 obtained from the Indonesian Financial Services Authority (OJK) and the Central Bank of Indonesia (BI). The data is analysed using the Vector Autoregression (VAR) method. The variables estimated include macroprudential policy instruments, including the Macroprudential Intermediation Ratio, Countercyclical Capital Buffer, Loan-to-Value ratio, Minimum Statutory Reserves, and Return on Assets. The results of the study found that most macroprudential measures do not have a substantial impact on the performance of conventional banks in Indonesia. Only Minimum Statutory Reserves significantly affect Return on Assets. Additionally, most variables do not exhibit reciprocal relationships. However, some variables display unidirectional effects. Specifically, the Countercyclical Capital Buffer has a significant causal impact on Return on Assets, while Minimum Statutory Reserves also play a notable role in affecting Return on Assets. Moreover, there is a causal relationship between the Macroprudential Intermediation Ratio and Minimum Statutory Reserves, as well as between the Countercyclical Capital Buffer and Minimum Statutory Reserves. The results of this study can contribute to policies in helping regulators formulate strategies to deal with future economic crises by ensuring that existing policies can maintain financial stability.

Keywords: *banking system, macroprudential policies, conventional banks, Return on Asset*

1. INTRODUCTION

Economic instability can severely impact financial stability, often leading to recessions or crises, as observed during the 1997/1998 Asian Financial Crisis and the 2008/2009 Global Financial Crisis. While Indonesia was deeply affected by the former, the country demonstrated notable resilience during the latter, despite widespread global economic disruption. However, Indonesia still encountered significant challenges, including banking liquidations and institutional financial shocks. Due to the interconnected nature of global financial systems, these issues were

further aggravated by pro-cyclical behaviours, which intensified systemic risks and contributed to instability across the financial sector (Sakti, et.al., 2018; Soseco, et.al. 2023).

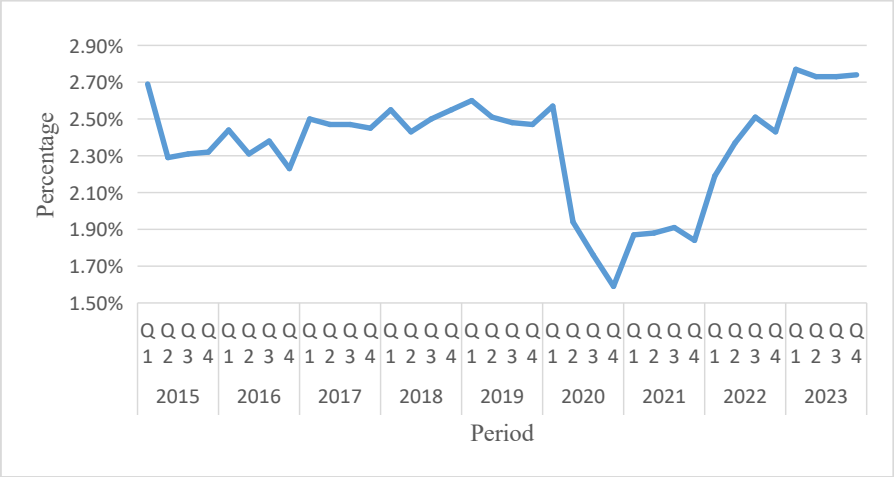
The Global Financial Crisis highlighted the fundamental link between macroeconomic stability and the health of the financial system. When financial institutions fail, the effectiveness of monetary policy is compromised, disrupting economic activity and leading to contractions in economic output (Bank Indonesia, 2024). In response, Indonesia implemented macroprudential policies in 2011, focusing on four primary instruments: the loan-to-value (LTV) ratio, the countercyclical capital buffer (CCB), the macroprudential intermediation ratio (MIR), and the macroprudential liquidity buffer (MPLB) (Wijayanti, 2020). These instruments were designed to mitigate systemic risk and maintain financial stability in both conventional and Islamic banking sectors. However, research indicates that conventional banks consistently outperform Islamic banks in several key performance metrics, raising questions regarding the effectiveness of these policies (Elsa, et.al., 2018; Sukmana & Febriyati, 2016).

According to Tomuleasa (2015), macroprudential policy aims to ensure the stability of the entire financial system by limiting systemic risks. Similarly, the Bank for International Settlements defines macroprudential policy as a set of measures designed to manage systemic risks and their associated costs (Kahou & Lehar, 2017). Such policies are essential to safeguard the financial system's health and prevent the loss of control over issues affecting specific sectors within the system. In Indonesia's context, Warjiyo & Juhro (2019) defines macroprudential policy as a framework established by the central bank to enhance the financial system's resilience and reduce systemic risks that could disrupt monetary stability.

In a study by Borio (2003), it is suggested that successful macroprudential policies ultimately support the objectives of microprudential policies, with the latter being subordinate to the former, as macroprudential policy focuses on the stability of the entire financial system. Carson & Ingves (2003) argues that even if macroprudential policies perform well, they cannot replace effective macroeconomic policies. He recommends a combination of both macroeconomic and prudential policies to mitigate economic shocks. According to Cerutti, et.al. (2017), macroprudential policy stands apart from other economic policies due to its unique characteristics. It operates not only through flexibility and reduced costs but also by addressing two key dimensions: time and cross-sectional aspects.

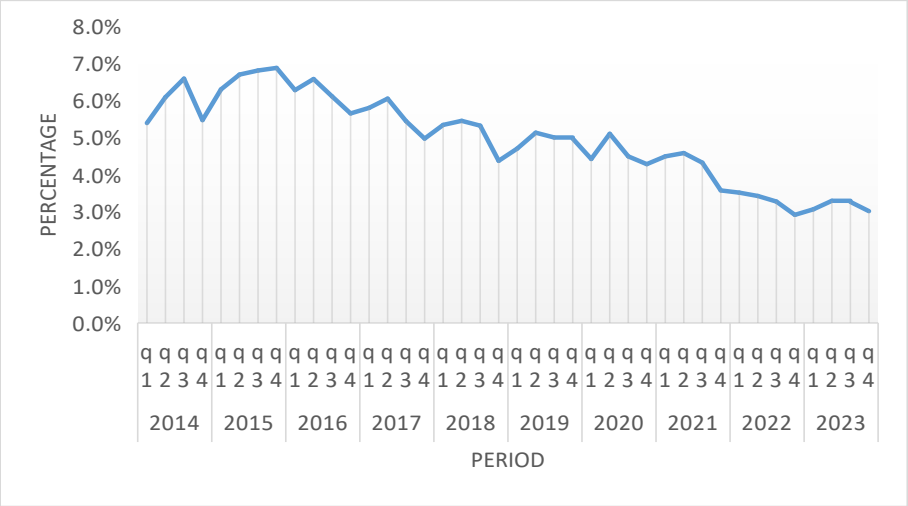
The period from 2014 to 2023 provides a critical timeframe for analysing the impact of macroprudential policy on the financial stability and performance of Indonesia's banking sector. During this time, Indonesia's banking sector faced several challenges, notably as the effects of the 2011 macroprudential policy implementation became more pronounced, with banking sector performance fluctuating due to both global and domestic shocks. In 2015, Indonesia's banking sector experienced a significant decline in Return on Assets (ROA) amid falling global commodity prices and uncertainty regarding U.S. Federal Reserve interest rates. A similar disruption occurred during the Covid-19 pandemic in 2020, as ROA declined sharply from 2.47% in Q1 to 1.59% in Q4 (Otoritas Jasa Keuangan, 2024) (Figures 1 and 2).

Figure 1. Return on Asset (ROA) of Conventional Banks in Indonesia



Source: Otoritas Jasa Keuangan (2024)

Figure 2. Non-Performing Loan of Conventional Banks in Indonesia, 2014-2023



Source: Bank Indonesia (2023)

Figures 1 and 2 present performance metrics of the banking sector during 2015-2023. Figure 1 illustrates the ROA of conventional banks from 2015 to 2023, illustrating how external factors such as global price shocks and the Covid-19 pandemic, led to significant fluctuations. Similarly, Figure 2 tracks Non-Performing Loan (NPL) rates from 2014 to 2023, showing a significant spike in 2015 due to rising interest rates, followed by another increase during the 2020 pandemic, which later stabilised.

By focusing on the period from 2015 to 2023, this study is uniquely positioned to provide valuable insights into how Indonesian banks navigated through various crises, including global economic shocks, commodity price fluctuations, and domestic challenges. These insights are crucial for evaluating the effectiveness of the macroprudential tools implemented during this period. The objective of this research is to examine the effects of macroprudential policies on the performance of conventional banks in Indonesia. By focusing on the period from 2014 to 2023, this study provides insight into how banks navigated various crises and the extent to which macroprudential tools succeeded—or fell short—in strengthening the banking system. Specifically, given the importance of financial system resilience, this study analyses how these

policies impacted key banking metrics, particularly within conventional banks, and what lessons can be drawn for future regulatory strategies. This paper contributes to policy development by offering a deeper understanding of the role of shock-mitigation policies and their long-term effectiveness.

The structure of this study is as follows: Section 2 reviews relevant literature, Section 3 outlines the research methodology, Section 4 presents the results and discussion; and Section 5 concludes with key findings.

2. LITERATURE THEORY

Banks play a significant economic role as financial intermediaries by transferring funds from surplus entities, which lack productive use, to deficit entities with productive opportunities. This intermediation role arises from high monitoring costs, liquidity constraints, and price risks resulting from asymmetric information between fund owners and companies utilising these funds (Chari, 2023; Khan, et.al. 2023).

A review of the literature identifies three different views on the role of banks in the economy (Werner, 2014; Bongomin, et.al., 2019). First, *the financial intermediation theory of banking* where banks as financial intermediaries that gather resources and re-allocate them, just like other non-bank financial institutions, and without any special powers. Second, *the fractional reserve theory of banking*. This is due to the uniqueness of the banking system. Unlike other financial institutions, banks can collectively create money based on the fractional reserve or money multiplier model of banking. Third, *the credit creation theory of banking*. Unlike the financial intermediation theory and in line with the fractional reserve theory, the banks can create loans not only from deposits or reserves but also create the entire loan amount out of nothing.

The macroprudential policy aims to limit financial risks that affect the banking system. Studies highlight its effectiveness, such as Davis, et.al. (2022), who examined the impact of macroprudential policies on bank profitability across 7,250 banks globally from 1990 to 2018. Their findings indicate that while macroprudential policy has a negative effect on profitability, its impact varies based on factors such as country, bank size, and time. Liutammima & Purnawan (2017) found that Loan-to-Value (LTV) ratios, Minimum Statutory Reserves, and Loan-to-Deposit Ratios do not significantly impact the performance of the dual banking system. In contrast, Olszak, et.al. (2019) demonstrated that borrower-based macroprudential measures, such as LTV limits and Debt-to-Income (DTI) ratios, operate countercyclically, mitigating the positive impact of capital ratios on lending, particularly during crises. Akinci & Olmstead-Rumsey (2018) observed that macroprudential tightening suppresses bank credit growth, housing credit growth, and house price appreciation.

To strengthen the resilience of the financial system and mitigate risks, macroprudential policy is essential, particularly in addressing the tendency of financial institutions to follow economic cycles (procyclicality), which can be detrimental. The European Systemic Risk Board (ESRB) defines macroprudential policy as a tool for maintaining financial stability, enhancing systemic resilience, and reducing systemic risk accumulation, thereby ensuring the sustainability of the financial sector and supporting economic growth (ESRB, 2013). Given the banking system's vulnerability to shocks and the procyclicality of risk, macroprudential instruments are designed to address balance sheet mismatches, reduce interbank linkages, and curb procyclicality, all aimed at containing systemic risk and preventing financial instability (Claessens, et.al., 2013).

In Indonesia, the implementation of macroprudential policy is partly a response to past economic crises, such as the 1997/1998 Asian Financial Crisis, which undermined investor confidence and severely impacted the financial and banking sectors. Indonesian law defines macropruden-

tial policy as the application of prudential principles in the financial system to balance macroeconomic and microeconomic objectives (Bank Indonesia, 2016). This policy is governed by Bank Indonesia Regulation No. 16/11/PBI.2014. Specifically, Article 2 of this regulation outlines the goals of macroprudential regulation and supervision: (1) preventing and reducing systemic risks, (2) promoting a balanced intermediation function, and (3) enhancing the efficiency of the financial system.

Several factors contribute to the limited impact of certain macroprudential policies on bank performance in Indonesia. Related to implementation gaps, effective implementation of macroprudential policies can be hindered by inadequate regulatory frameworks or enforcement challenges. If banks do not fully comply with the requirements or if there is a lack of clarity in the regulations, the intended effects of policies like the Countercyclical Capital Buffer (CCyB) or Minimum Statutory Reserves (GWM) may not materialise (Lee, 2017). The impact of macroprudential policies can also be muted by market conditions. For instance, during periods of economic growth, banks may prioritise expanding their loan portfolios over adhering to capital buffers, resulting in a dilution of the intended stabilising effects of policies like the CcyB (Anwar, et.al., 2014; Avgouleas & Duoqi, 2017).

A comparison with neighbouring countries reveals that the performance of the banking intermediary function in Indonesia is relatively low compared to banks in the Southeast Asian region (Bank Indonesia, 2017). Assessment using indicators such as net interest margin (NIM) and return on assets (ROA), Indonesian banks rank among the highest in the region (Schaltegger, 2012). The significance of Return on Assets (ROA) as an indicator of resource efficiency among Indonesian banks is further supported by studies conducted by Anis, et.al. (2023), Wahyuni, et.al. (2023), and Handajani, et.al. (2024). Conversely, in terms of non-performing loans (NPL) and cost-to-income ratio (CIR), Indonesian Banks rank as the second-lowest in the region, just above the Philippines. These findings highlight challenges in defining sustainability, with a focus on corporate philanthropy, low awareness of sustainability risk, and corporate sustainability performance that is often more symbolic than substantive (Schaltegger, 2012).

While Indonesia has made significant progress in implementing macroprudential policies, the effectiveness in terms of compliance among conventional commercial banks is mixed, particularly due to procyclical behaviours. In contrast, Malaysia, Thailand, and the Philippines have established more effective frameworks that not only enhance compliance but also mitigate systemic risks through proactive regulation and oversight. These countries demonstrate higher resilience in their financial systems, suggesting valuable lessons for Indonesia in refining its macroprudential approach.

In Indonesia, compliance among conventional commercial banks in Indonesia has improved, with an average capital adequacy ratio (CAR) of 20.4% in 2023, above the required of 8%-14% (Otoritas Jasa Keuangan, 2023). However, the effectiveness is sometimes undermined by the banks' inclination toward aggressive lending during economic upturns, leading to procyclical behaviours. Indonesia faced higher NPLs compared to other ASEAN countries, which were around 3.2% in early 2023 (Otoritas Jasa Keuangan, 2023). The slower implementation of robust measures contributed to this vulnerability, particularly during global financial fluctuations.

While in Malaysia, The Central Bank of Malaysia (BNM) has effectively utilised tools such as the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR). Malaysian banks reported high compliance rates, with over 90% meeting liquidity requirements as of 2023 (Bank Negara Malaysia, 2023). In the resilience aspect, as of 2022, Malaysia reported an NPL ratio of 1.9%, which is one of the lowest in the region (Bank Negara Malaysia, 2023). In Thailand, the Bank of Thailand has focused on managing household debt through debt-to-income (DTI) ratios and other targeted measures which have demonstrated high compliance with these reg-

ulations, resulting in a stable financial sector. As of 2023, Thailand's NPL ratio stood at 2.8%, reflecting effective risk management in the banking sector (Bank of Thailand, 2023). In the Philippines, the effectiveness of the Bangko Sentral ng Pilipinas (BSP) has implemented a flexible macroprudential framework, allowing strong compliance, with banks adhering to the countercyclical capital buffer requirements. The NPL ratio stands at 3.5%, reflecting robust risk management practices (BSP, 2023).

3. METHODOLOGY

3. 1. DATA

This research utilises quarterly data from the annual reports of conventional commercial banks in Indonesia, from 2014 to 2023. The data is sourced from the Indonesian Banking Statistics provided by the Financial Services Authority (OJK) and the Indonesian Financial System Statistics from the Central Bank of Indonesia (BI). Some reasons for using this period are first, although Indonesia's macroprudential policies, aimed to address systemic risks, such as excessive credit growth, asset bubbles, and financial market vulnerabilities, officially started in 2011, their full effects began to manifest more clearly from 2014 onward (Azis & Shin, 2015; Arimurti, 2020). Second, the Indonesian banking sector underwent significant reforms, with a growing emphasis on digital banking, financial inclusion, and the expansion of banking services to underserved populations (Sugarda & Wicaksono, 2017; Triggs, et.al., 2019).

The exclusion of Islamic banks from the analysis is due to some reasons. First, related to economic models, Islamic banks have a distinct operating model from conventional ones where they operate under Sharia principles, which prohibit interest (*riba*) and emphasise risk-sharing. It also has different risk management strategies, such as profit-and-loss sharing arrangements. This fundamental difference in their operational model affects their financial behaviour and metrics, making comparisons with conventional banks less applicable (Bashir & Gorton, 2023; Van Greuning & Iqbal, 2008). Second, related to regulatory and supervisory, the regulatory framework governing Islamic banks differs significantly from that of conventional banks, involving unique compliance standards and oversight mechanisms, hence, this divergence impacts how each type of bank responds to macroprudential policies, necessitating a separate analysis (Hanif, 2014; Wan Ibrahim & Ismail, 2015). Further, despite their distinct characteristics, Islamic banks have a small contribution to Indonesian banking sectors, shown by their assets which are 10.81% of total assets (cnbcindonesia, 2024) and a market share of 7.27% (perbankansyariah.id, 2024).

The key variable analysed is Return on Assets (ROA), a metric that measures a bank's profitability relative to its total assets. ROA reflects how effectively a bank generates profit (net income) from the capital invested in its assets. A higher ROA indicates more efficient resource use and stronger management performance (Corporate Finance Institute, 2024). Return on Assets (ROA) is often favoured as a key performance metric for several reasons. First, it serves as an overall efficiency indicator, measuring how effectively a bank utilises its assets to generate profits. Since banks primarily operate by managing assets such as loans and investments, ROA provides a clear indication of operational efficiency (Dao, 2020). Second, ROA is simple and clear, making it straightforward to calculate and understand. It gives stakeholders a quick snapshot of profitability relative to total assets, facilitating assessment without extensive financial analysis (Blessing & Sakouvogui, 2023). This simplicity enhances its utility for investors and regulators alike. Additionally, ROA allows for easy benchmarking across banks of varying sizes and structures, enabling performance comparisons within the banking sector (Rakshit, 2023). It provides a holistic view of asset management, encompassing the entire asset base rather than

focusing solely on equity, as seen in Return on Equity (ROE) (Bashir & Gorton, 2023).

The study examines several macroprudential instruments. The RIM (Macroprudential Intermediation Ratio) ensures that financial institutions maintain a balanced approach between facilitating financial intermediation and managing risks. The Countercyclical Capital Buffer (CCyB) is intended to protect the banking system from periods of excessive credit growth, which can lead to financial instability. It is an additional capital requirement intended to cushion against potential losses resulting from excessive credit growth, which could pose risks to financial system stability (Bank Indonesia, 2024). The Loan-to-Value (LTV) ratio controls the level of risk banks assume when issuing loans, particularly in property financing. It represents the ratio of the loan value to the value of the collateral, typically property, at the time the loan is issued, based on the most recent evaluation (Bank Indonesia, 2024). Lastly, the Minimum Statutory Reserves (GWM), reflects a liquidity requirement that ensures banks maintain sufficient reserves to meet withdrawal demand and uphold stability during periods of financial stress. It is the cash reserves that financial institutions must hold to meet central bank requirements (Investopedia, 2024).

3. 2. EMPIRICAL STRATEGY

To examine the relationships between key macroprudential instruments and bank performance metrics, we employed a Vector Autoregression (VAR) model. The VAR model is particularly suitable for this study as it enables the analysis of multiple interdependent time series and can capture dynamic interactions among the variables over time. This method treats all variables symmetrically, modelling each variable as a function of its lags and the lags of the other variables in the system, making it ideal for understanding the reciprocal impacts among the variables in question (Dean & Bailes, 2010; Paxton, et.al., 2011).

The equations used in the VAR model are as follows:

$$ROA_t = \alpha_1 + \beta_{11}ROA_{t-1} + \beta_{12}RIM_{t-1} + \beta_{13}CCyB_{t-1} + \beta_{14}LTV_{t-1} + \beta_{15}GWM_{t-1} + \varepsilon_t \quad (1)$$

$$RIM_t = \alpha_2 + \beta_{21}ROA_{t-1} + \beta_{22}RIM_{t-1} + \beta_{23}CCyB_{t-1} + \beta_{24}LTV_{t-1} + \beta_{25}GWM_{t-1} + \varepsilon_t \quad (2)$$

$$CCyB_t = \alpha_3 + \beta_{31}ROA_{t-1} + \beta_{32}RIM_{t-1} + \beta_{33}CCyB_{t-1} + \beta_{34}LTV_{t-1} + \beta_{35}GWM_{t-1} + \varepsilon_t \quad (3)$$

$$LTV_t = \alpha_4 + \beta_{41}ROA_{t-1} + \beta_{42}RIM_{t-1} + \beta_{43}CCyB_{t-1} + \beta_{44}LTV_{t-1} + \beta_{45}GWM_{t-1} + \varepsilon_t \quad (4)$$

$$GWM_t = \alpha_5 + \beta_{51}ROA_{t-1} + \beta_{52}RIM_{t-1} + \beta_{53}CCyB_{t-1} + \beta_{54}LTV_{t-1} + \beta_{55}GWM_{t-1} + \varepsilon_t \quad (5)$$

Where:

ROA = Return on Assets

RIM = Macroprudential Intermediation Ratio

$CCyB$ = Countercyclical Capital Buffer

LTV = Loan-to-Value Ratio

GWM = Minimum Statutory Reserves

ε_{τ} = the error term in each equation.

To achieve the research objective, we conducted the estimation procedure as follows: Before the estimation VAR model, the data series will be tested for stationarity using the Augmented Dickey-Fuller (ADF) test. If any non-stationary variables are identified, they will be differenced to achieve stationarity, which is essential for accurate VAR analysis.

The ADF test is based on the following autoregressive model:

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \sum_{i=1}^{p} \delta_i \Delta y_{t-1} + \epsilon_t$$

Where:

Δy_t = first difference of the time series at time t

α = a constant (drift term)

β_i = a time trend term

y_{t-1} = lagged value of the time series

$\Sigma_{i=1}^{p} \delta_i \Delta y_{t-1}$ = sum of lagged first differences of the time series (to account for autocorrelation

ϵ_t = error term

The null and alternative hypotheses in the ADF test are:

Null Hypothesis (H_0): The time series has a unit root, meaning the series is non-stationary. $\gamma = 0$ (i.e., the coefficient of y_{t-1} is 0)

Alternative Hypothesis (H_1): The time series does not have a unit root, meaning the series is stationary. $\gamma < 0$ (i.e., the coefficient of y_{t-1} is negative)

To enhance our understanding of the dynamic interactions between the variables, we generate Impulse Response Functions (IRF). It is used to help trace the response of one variable to a shock in another variable over time. The IRF is computed based on the system of equations that model the interrelationships between the variables. In a VAR model of order p, the system can be written as:

$$Y_t = \alpha + \sum_{i=1}^{p} \Phi_i Y_{t-1} + \epsilon_t$$

Where:

Y_t = a vector of n endogenous variables at time t

α = a vector of constants (intercepts)

Φ_i = matrices of coefficients for lag i

ϵ_t = error term

4. RESULT AND DISCUSSION

4. 1. VECTOR AUTOREGRESSION TEST

Table 1 presents the descriptive data. During 2014-2023, Return on Assets (ROA) shows a decline during the COVID-19 pandemic, dropping from 2.57% in Q1 2020 to 1.59% in Q4 2020, but recovers in subsequent years, indicating a return to profitability. The Macroprudential Intermediation Ratio (RIM) and Loan-to-Value (LTV) ratios remain relatively stable, with LTV peaking at 32.03% in 2016 before decreasing, reflecting changing lending conditions. The Countercyclical Capital Buffer (CCyB) steadily increases from around 18% in 2014 to over 25% in 2023, signalling a more cautious regulatory stance, particularly in response to economic uncertainties like the pandemic. Meanwhile, Minimum Statutory Reserves (GWM) remain consistent, underscoring stable liquidity requirements.

Table 1. Descriptive Statistics

Year	Quartile	ROA	RIM	CCyB	LTV	GWM
2014	Q1	3.01	1.05	18.17	22.73	26.47
2014	Q2	3.02	1.03	17.79	18.00	26.51
2014	Q3	2.91	1.02	17.91	13.20	26.56
2014	Q4	2.85	1.03	18.01	13.79	26.61
2015	Q1	2.72	1.03	18.40	13.78	26.62
2015	Q2	2.29	1.02	17.75	7.51	26.66
2015	Q3	2.31	1.02	18.14	7.68	26.69
2015	Q4	2.32	1.05	19.00	7.24	26.70
2016	Q1	2.44	1.06	19.42	7.89	26.52
2016	Q2	2.31	1.07	20.04	7.90	26.55
2016	Q3	2.38	1.08	20.89	29.11	26.60
2016	Q4	2.23	1.06	21.19	32.03	26.64
2017	Q1	2.50	1.06	21.13	27.83	26.65
2017	Q2	2.47	1.05	21.00	29.80	26.69
2017	Q3	2.47	1.05	21.50	10.92	26.69
2017	Q4	2.45	1.07	21.50	9.26	26.68
2018	Q1	2.55	1.09	20.98	12.94	26.71
2018	Q2	2.43	1.08	20.42	12.30	26.72
2018	Q3	2.50	1.09	21.19	12.47	26.74
2018	Q4	2.55	1.09	21.29	12.10	26.76
2019	Q1	2.60	1.10	21.77	11.58	26.74
2019	Q2	2.51	1.09	21.05	10.83	26.69
2019	Q3	2.48	1.09	21.70	8.82	26.73
2019	Q4	2.47	1.08	21.86	6.67	26.73
2020	Q1	2.57	1.07	19.95	5.33	26.60
2020	Q2	1.94	1.06	20.89	1.88	26.29
2020	Q3	1.76	1.02	21.83	0.37	26.29
2020	Q4	1.59	1.02	22.24	1.05	26.44
2021	Q1	1.87	1.02	22.24	1.60	26.31
2021	Q2	1.88	1.02	22.54	4.38	26.49
2021	Q3	1.91	1.02	23.59	5.75	26.65
2021	Q4	1.84	1.00	24.07	6.11	26.92
2022	Q1	2.19	1.01	23.17	9.47	26.87
2022	Q2	2.37	1.04	22.99	11.51	26.95
2022	Q3	2.51	1.04	23.49	12.48	27.18
2022	Q4	2.43	1.12	24.10	12.98	27.35
2023	Q1	2.80	1.03	23.32	9.58	27.16
2023	Q2	2.76	1.04	25.17	6.77	27.14
2023	Q3	2.76	1.06	25.75	5.43	27.15
2023	Q4	2.78	1.06	26.01	6.18	27.20

Note: ROA = Return of Asset, RIM = Macroprudential Intermediation Ratio, CcyB = Countercyclical Capital Buffer, LTV = Loan to Value, GWM = Minimum Statutory Reserves.

Source: Authors' calculations

Table 2 presents the results of the Granger causality test, which examines causal relationships among the financial metrics. The null hypotheses indicate that no causal relationship exists

between the respective variables. The F-statistics and corresponding p-values assess the significance of these relationships. The results indicate that CCyB and GWM significantly influence ROA, with p-values of 0.04 and 0.00, respectively. This suggests that changes in these macroprudential policies affect bank profitability. Conversely, the null hypotheses for RIM and ROA, as well as LTV and ROA, show no significant causal relationships, with p-values exceeding 0.1. Additionally, while GWM does not cause changes in RIM, the opposite is true, indicating that fluctuations in RIM do influence GWM (p-value of 0.01).

Table 2. Granger Causality Test

Null Hypothesis	Obs	F-Statistic	Prob.
RIM has no causal relationship with ROA	38	0.64	0.43
ROA has no causal relationship with RIM	38	1.96	0.17
CCYB has a causal relationship with ROA	38	4.38	0.04*
ROA has no causal relationship with CCYB	38	0.47	8.33
LTV has no causal relationship with ROA	38	1.38	0.25
ROA has no causal relationship with LTV	38	0.47	0.50
GWM has a causal relationship with ROA	38	14.63	0.00*
ROA has no causal relationship with GWM	38	0.75	0.39
CCyB has no causal relationship with RIM	38	0.00	0.95
RIM has no causal relationship with CCyB	38	1.87	0.18
LTV has no causal relationship with RIM	38	0.10	0.76
RIM has no causal relationship with LTV	38	0.13	0.72
GWM has no causal relationship with RIM	38	1.35	0.25
RIM has a causal relationship with GWM	38	5.96	0.01*
LTV has no causal relationship with CCyB	38	0.69	0.41
CCyB has no causal relationship with LTV	38	0.02	0.90
GWM has no causal relationship with CCyB	38	0.08	0.78
CCyB has no causal relationship with GWM	38	3.22	0.08*
GWM has no causal relationship with LTV	38	0.20	0.66
LTV has no causal relationship with GWM	38	0.01	0.92

Note: *p<0.1, **p<0.05, ***p<0.01.

Source: Authors' calculations

Table 3 presents the VAR estimation where ROA is significantly influenced by its past values, indicating that bank profitability tends to persist over time. Similarly, GWM and CCyB show strong self-influence, suggesting that higher reserves and capital buffers in previous periods tend to enhance their stability in the current period. Additionally, RIM negatively impacts GWM, suggesting that as financial institutions engage in more lending activities (reflected by a higher RIM), they may reduce their statutory reserves. In contrast, LTV does not significantly impact the other variables, except for a positive effect on itself. The use of VAR estimation aims to assess the influence of variables within the VAR analysis system. If the t-count result exceeds the t-table value, it indicates a significant effect. Conversely, if the t-count is smaller than the t-table, it suggests no significant effect. The t-table results in this study were 2.03.

Table 3. VAR Estimation

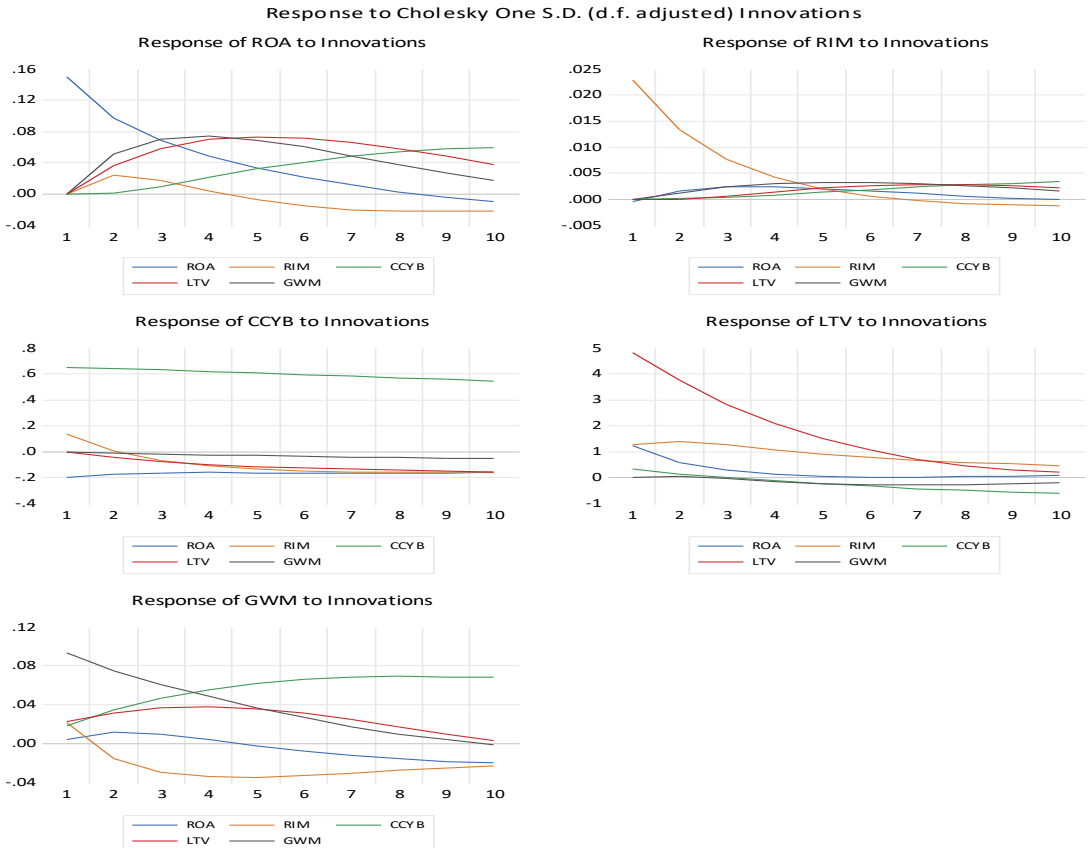
	ROA	RIM	CCyB	LTV	GWM
ROA(-1)	0.57	0.01	0.24	-2.60	0.07
	-0.11	-0.02	-0.53	-3.91	-0.08
	[5.02]*	[0.733]	[0.44]	[-0.66]	[0.85]
RIM(-1)	0.35	0.58	-5.20	18.41	-1.74
	-0.93	-0.14	-4.32	-31.84	-0.62
	[0.38]	[4.07]*	[-1.20]	[0.57]	[-2.80]*
CCyB(-1)	-0.02	0.00	0.99	-0.20	0.03
	-0.02	0.00	-0.09	-0.68	-0.01
	[-0.79]	[-0.05]	[10.81]*	[-0.29]	[2.18]*
LTV(-1)	-0.01	0.00	-0,01	0.78	0.00
	0.00	0.00	-0.02	-0.12	0.00
	[1.43]	[-0.10]	[-0.54]	[6.28]*	[1.20]
GWM(-1)	0.54	0.01	-0.17	0.36	0.80
	-0.17	-0.03	-0.81	-5.94	-0.12
	[3.11]*	[0.48]	[-0.20]	[0.06]	[6.88]*
C	-13.50	0.08	9.88	-16.47	6.41
	-4.27	-0.65	-19.85	-146.44	-2.86
	[-3.16]	[0.12]	[0.14]	[-0.11]	[2.24]

Note: *p<0.1, **p<0.05, ***p<0.01.

Source: Authors' calculations

Table 3 shows that while some variables influence others, most have no significant effect. The key findings are as follows: (1) ROA(-1) affects only the ROA variable, with no impact on RIM, CCyB, LTV, or GWM; (2) RIM(-1) influences both RIM and GWM but does not affect ROA, CCyB, or LTV; (3) CCyB(-1) impacts CCyB and GWM, with no effect on ROA, RIM, or LTV; (4) LTV(-1) affects only LTV, without influencing ROA, RIM, CCyB, or GWM; and (5) GWM(-1) influences both ROA and GWM, but has no impact on RIM, CCyB, or LTV.

Figure 3. Impulse Response Function



Source: Authors' calculations

Figure 3 illustrates the response of one variable to another when a shock occurs, showing fluctuations in the response graph that represent the interaction between variables. First, ROA's response to other variables varies: its response to itself persists until the 9th period, to RIM until the 4th period, and to CCyB starting from the 2nd period. ROA's response to LTV is immediate, beginning in the 1st period, while its response to GWM also starts in the 1st period. Second, the RIM shows a minimal response to ROA, with a self-response lasting from the 1st to the 5th period. RIM's responses to CCyB, LTV, and GWM are also minimal, starting from the 2nd period.

Third, CCyB shows a negative response to ROA starting from the 1st period and to RIM during the 1st and 2nd periods. However, CCyB exhibits a strong self-response from the 1st period, while LTV shows a negative response and GWM shows no response. Fourth, the LTV variable responds to ROA between the 1st and 4th periods and shows a response to RIM starting from the 1st period. However, its response to CCyB is insignificant, even negative. LTV itself shows a strong self-response throughout all periods. Fifth, GWM shows a small response to ROA from the 1st and 4th periods, followed by a negative response. GWM's response to RIM declines from the 1st period, while its response to CCyB is significant starting from the 1st period, showing a strong response to LTV from the 1st period onwards. GWM exhibits a lasting response until the 9th period.

4. 2. DISCUSSION

The analysis of Vector Autoregression (VAR) and the Granger causality test show that most variables do not exhibit reciprocal relationships. However, there are notable instances where some variables have unidirectional relationships, for instance, the CCyB has a significant causal relationship with the ROA and the GWM that also significantly influences ROA. Additionally, the RIM has a causal relationship with GWM and the CCyB shows a causal link to GWM.

The VAR estimation results highlight that several variables tend to affect themselves rather than other variables. For example, ROA impacts itself with a notable estimation of 5.02%, indicating a degree of persistence in its performance over time. Similarly, RIM influences itself with a 4.07% estimation, while it also affects GWM with an estimated impact of 2.8%. This self-influencing characteristic is also observed in CCyB, which shows a strong self-impact of 10.8%, and LTV, which influences itself with an estimated effect of 6.2%. GWM has a notable influence on ROA with an estimation of 3.1% and impacts itself by 6.8%.

In comparison to previous studies, these results are consistent with the findings of Davis (2022), who argued that macroprudential policy instruments have limited direct effects on banking performance, particularly in the short term. This study further reveals that the Macroprudential Intermediation Ratio (RIM) does not significantly influence ROA in Indonesia's conventional banking sector, as indicated by the lack of response in the impulse response function. This finding is supported by Hermanto and Nurhidayah (2023), who also found that RIM does not affect company profitability. Moreover, research by Rosdiana, et.al. (2021) corroborates this, concluding that RIM does not affect credit growth, even though high credit levels are often associated with increased RIM.

The impact of the Countercyclical Capital Buffer on ROA in this study contrasts with previous findings by Mainata and Ardini (2018), who suggested that a higher CCyB enhances banks' ability to withstand risk and increases profitability. While the Granger causality test in this study indicates a relationship between CCyB and ROA, the VAR model does not support this finding. This discrepancy suggests that, although a connection may exist, it is not as strong or consistent as previously believed, and CCyB's role in enhancing bank performance may vary depending on the timeframe or specific economic conditions.

The Loan-to-Value (LTV) ratio shows no significant influence on ROA, as demonstrated in both the VAR estimation and the impulse response function. This finding aligns with Khatik (2021), who indicated that credit growth does not directly impact profitability because banks often prioritise equity over loan growth. However, this conclusion contradicts earlier studies, such as Pradana and Sampurno (2013), who argued that homeownership credit—closely tied to LTV—can affect profitability. The lack of impact of LTV on ROA in this study may stem from broader economic factors that moderate the relationship between credit growth and profitability.

Finally, the findings confirm that Minimum Statutory Reserves (GWM) significantly influence ROA. This is supported by Elvira, et.al. (2020), who explain that higher statutory reserves reduce the available funds for banks to invest, consequently leading to a slight decrease in profits. However, this finding contradicts Ross, et.al. (2021), who argued that GWM does not significantly affect ROA. The contrasting results highlight the complex and sometimes contradictory nature of macroprudential policies and their effects on banking performance, with specific variables such as GWM playing a crucial role in determining the profitability of conventional banks in Indonesia.

Some global economic events influenced the effectiveness of macroprudential policies in Indonesia. For example, the global economic slowdowns reduce demand for Indonesia's exports, which are crucial for the country's economic health. When international markets contract, Indonesian industries reliant on exports—such as palm oil, textiles, and minerals—experience decreased revenue. This downturn can lead to increased unemployment and financial strain on businesses, ultimately resulting in higher non-performing loans (NPLs) for banks. During the Covid-19 pandemic, the World Bank projected Indonesia's economy would contract by 1.6% in 2020 (World Bank, 2020). Despite existing macroprudential policies, banks faced rising NPLs as borrowers struggled to meet obligations, revealing the limitations of these policies in an economic crisis.

Further, the changes in global interest rates, particularly decisions made by central banks in developed economies, have a direct impact on capital flows to emerging markets like Indonesia. When interest rates rise in other major countries, investments in those markets become more attractive, leading to capital outflows from Indonesia, hence, resulting in currency depreciation, increased borrowing costs, and liquidity constraints for banks. The example is following the U.S. Federal Reserve's rate hikes in 2015, Indonesia experienced capital flight, which caused the rupiah to depreciate significantly. This depreciation heightened liquidity issues for banks, making it difficult for them to extend credit (Bank Indonesia, 2015).

Discussion on the long-term effects of macroprudential policies in Indonesia is important as it can be beneficial for enhanced financial stability where a stable banking sector can foster investor confidence and encourage both domestic and foreign investment. Further, it will lead to sustainable lending practices where in the long term, as banks refine their risk assessment capabilities, they may be better positioned to support sustainable credit growth which is particularly important for sectors like micro, small, and medium enterprises (MSMEs). In the behavioural changes in risk management, continued emphasis on prudent risk management can help mitigate the impact of future economic shocks, ensuring that banks remain robust and capable of supporting economic growth even in challenging conditions (Hope, et.al., 2008; van der Hoog, 2018; Persaud, 2000).

Some policy recommendations can be delivered. First, the government needs to strengthen the Countercyclical Capital Buffer (CCyB) mechanism by establishing a real-time monitoring system. This system can continuously monitor credit growth and macroeconomic indicators through a set of specific thresholds (e.g., rapid credit growth exceeding a defined percentage) that automatically trigger adjustments to the CCyB, increasing it to 1% or more during peri-

ods of high risk. Second, the government should revise Minimum Statutory Reserves (GWM) Policies by introducing a Tiered GWM System. Develop a tiered system where smaller banks with lower risk profiles can maintain GWM at a reduced rate (e.g., 2% instead of 4%) to promote lending. Indonesia should also allow temporary reserve reductions that enable banks to apply for temporary reductions in GWM during economic downturns (e.g., a 1% reduction) to improve liquidity. At the same time, banks must demonstrate a clear plan for how they will manage risk while accessing these reduced requirements.

5. CONCLUSION

The importance of a resilient banking system in Indonesia is required to deal with economic crises. This research examines the impact of macroprudential policies on the performance of conventional banks in Indonesia. Our results show that most macroprudential policy instruments do not have a significant relationship with banking performance. While the Countercyclical Capital Buffer and Minimum Statutory Reserves show a relationship with Return on Assets, the Macroprudential Intermediation Ratio, Loan to Value, and Countercyclical Capital Buffer do not directly influence Return on Assets. Notably, only the Minimum Statutory Reserves have a significant effect on Return on Assets.

We also find that, except for the Minimum Statutory Reserve, none of the macroprudential policy instruments significantly influence the Return on Assets. Most variables do not exhibit reciprocal relationships; however, some display unidirectional relationships. Notably, the Countercyclical Capital Buffer has a significant causal relationship with the Return on Assets, and the Minimum Statutory Reserves also significantly influence the Return on Assets. Additionally, the Macroprudential Intermediation Ratio has a causal relationship with Minimum Statutory Reserves, and the Countercyclical Capital Buffer shows a causal link to Minimum Statutory Reserves.

As the effectiveness of macroprudential policies established by the central bank can be assessed by the extent of compliance among conventional commercial banks, the government must ensure that these policies align with the broader objectives of strengthening financial system resilience and mitigating systemic risks associated with inter-institutional linkages and procyclical behaviours. Consequently, implementing macroprudential policies is crucial for stabilising the financial system, even if some instruments may not yield immediate or significant effects on banking performance. This study is limited to the annual reports of conventional commercial banks in Indonesia, spanning the period from 2014 to 2023. So for further research, it can be confirmed qualitatively by involving interviews with interested parties to obtain more complex findings. This study adds to the understanding of the impact of macroprudential policies on conventional bank performance, providing empirical insights into the relationship between policy and performance. In addition, it provides an analytical model that can be used in further research to evaluate the effectiveness of banking policies in other countries or different contexts. The results of this study can contribute to policies in helping regulators formulate strategies to deal with future economic crises by ensuring that existing policies can maintain financial stability.

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