Multidiciplinary Output Research For Actual and International Issue (MORFAI Journal) ISSN (e): 2808-6635
Volumes 6 No. 1 (2025)

ANALYSIS OF THE IMPACT OF COVID-19 ON THE CAPITAL OF RURAL BANKS (BPR) AND SHARIA RURAL BANKS (BPRS) IN THE JAVA-BALI REGION

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Received	: 20 September 2025	Published	: 13 December 2025
Revised	: 10 October 2025	DOI	: https://doi.org/10.54443/morfai.v6i1.4712
Accepted	: 13 November 2025	Link Publish	: https://radjapublika.com/index.php/MORFAI/article/view/4712

Abstraction

The COVID-19 pandemic has put significant pressure on banking stability, including for Rural Banks (BPR) and BPRS, which are more vulnerable than commercial banks. This situation necessitates an understanding of how internal and external factors influence the capital strength of regional banks, particularly in the Java-Bali region, which has distinct economic dynamics. This study analyzes the factors influencing the Capital Adequacy Ratio (CAR) of Rural Banks (BPR) in the Java-Bali region during the 2019 Q4 – 2024 Q4 period. Using panel data of 180 BPRs and the Random Effects Model (REM) estimation method, this study examines the effects of COVID-19, regional characteristics (Bali dummy), profitability (ROA), operational efficiency (BOPO), bank size (log total assets), and market concentration (log HHI) on CAR. The results showed that Covid-19 had a negative and significant impact on CAR, indicating a weakening of the capital position of rural banks (BPRs) during the pandemic. Profitability had a positive effect on CAR, while operational inefficiency (high BOPO) and larger bank size were associated with lower CAR. Conversely, location (Bali) and market concentration variables did not show a significant effect. These findings confirm that BPRs' internal performance, particularly profitability, efficiency, and asset growth management, are key factors in strengthening capital buffers, while external shocks such as Covid-19 remain a risk that needs to be anticipated.

Keywords: Capital Adequacy Ratio, BPR, Covid-19, Profitability, Efficiency, Bank Size, Market Concentration, Random Effect Model.

INTRODUCTION

The COVID-19 pandemic impacted 34 provinces in Indonesia, encompassing 510 regencies/cities, by the end of December 2020. From a distribution perspective, nearly 60% of the total national cases remained concentrated on Java Island, the center of economic activity and the region with the largest population in Indonesia (Ministry of Finance, 2022). The most significant impact of the COVID-19 pandemic was on the economic and monetary sectors, as demonstrated by Indonesia's economic growth rate in 2020, which reached its lowest point at minus 2.07 percent. Another impact of this decline in economic performance was the significant disruption of business activities in terms of production, distribution, and other operational activities. One of the most impacted business segments was MSMEs, which caused quite serious problems due to the significant contribution of this sector to the country's GDP, amounting to 60.5% and able to absorb approximately 97% of the workforce in Indonesia.

MSMEs in Indonesia continue to be supported by various financial institutions, including rural banks (BPR) and rural banks (BPRS), hereinafter referred to as BPRs. These institutions play a crucial role in financing and managing their businesses, particularly in terms of financial access. BPRs, regulated by Law No. 10/1998 concerning Banking, amended from the previous Law (Law No. 7/1992), aim to assist small businesses and rural communities. Thus, BPRs can operate both conventionally and based on Sharia principles, but they cannot provide payment services due to the aforementioned law (PERBARINDO, 2024). However, despite the significant role of rural banks (BPRs) in the economy, the number of rural banks (BPRs) in Indonesia showed a downward trend from 2016 to December 2023. The number of rural banks (BPRs) fell from 1,633 to 1,402. This decline was largely due to the increasingly unified BPR industry through mergers and amalgamations. However, the decline in the number of BPRs was not accompanied by a decrease in service access. Instead, the number of BPR branches increased by 333, to a total of 1,938. Meanwhile, the number of BPRSs also increased to 174 BPRSs during the same period (OJK, 2024).

The rural bank (BPR) industry in Indonesia continues to face challenges related to relatively limited capital. Most BPRs are considered undercapitalized, with 24.1% of the total BPRs failing to meet the minimum core capital (MIM) requirement of IDR 6 billion. Strong funding is crucial for supporting BPRs and BPRSs in managing operations more efficiently, enhancing systems and management, and improving the quality of resources and operational cost management (OJK, 2024). BPRs with low capital tend to face problems such as high fraud rates, business license revocations, and poor financial performance, particularly in terms of profitability and efficiency (OJK, 2024). Smaller BPRs also have lower market power, on average, indicating that operational costs are higher than their revenues. This inefficiency can stem from interest costs, where many depositors keep their money with BPRs to obtain higher interest rates than larger commercial banks, or from non-interest costs, related to the suboptimal use of information technology (IT) in BPR operations (OJK, 2024).

BPRs with core capital of less than IDR 6 billion experience lower asset and credit growth than the industry average (OJK, 2024), are more likely to incur losses, have high credit risk, and have low levels of governance compliance. Small-scale BPRs contribute only around 5% to the overall BPR industry, both in terms of assets, credit, and third-party funds, and serve no more than 8% of total customers (OJK, 2024). The Financial Services Authority (OJK) has regulated paid-up capital through OJK Regulation No. 62/POJK.03/2020 concerning rural banks (BPR), and OJK Regulation No. 5/POJK.03/2015 concerning the fulfillment of minimum core capital requirements for rural banks. These policies are designed to ensure that rural banks have adequate assets with strong characteristics, thus not only strengthening the institution but also increasing its risk-absorbing capacity. With this capital strengthening, rural banks are expected to be more effective in channeling funds to real-world units, particularly to MSEs, which are a priority in supporting the local economy (OJK, 2024).

Strengthening capital is expected to increase the competitiveness of rural banks (BPR) and rural banks (BPRS), particularly in increasing the distribution of credit or funding to MSMEs, as well as strengthening risk management and governance. The Financial Services Authority (OJK) has set the Minimum Minimum Investment (MIM) for rural banks (BPR) and rural banks (BPRS) at IDR 6 billion, which BPRs must meet by December 2024 and BPRS by December 2025. Furthermore, the OJK has also issued regulations regarding the establishment of new, more selective rural banks (BPRs), with zoning adjustments and increased paid-in capital, to ensure the resilience and competitiveness of the rural bank industry in the future (OJK, 2024). In support of the National Economic Recovery (PEN) policy and in response to the impact of the COVID-19 outbreak, the Financial Services Authority (OJK) issued Regulation Number 34/POJK.03/2020 concerning Policies for BPRs and BPRSs on June 2, 2020. This regulation was then updated through OJK Regulation Number 2/POJK.03/2021, and implemented on February 18, 2021. Although the outbreak is still ongoing and various restrictions on community activities remain in place, several economic indicators show improvement. However, anticipatory measures are still needed to manage the performance of BPR credit or BPRS financing, to ensure the resilience of this sector after the end of the implemented stimulus provisions. (OJK, 2021).

The banking sector, particularly rural banks (BPR) and rural banks (BPRS), which play a crucial role at the regional level, must remain stable. The relaxation policy implemented by the Financial Services Authority (OJK) to mitigate the impact of the COVID-19 pandemic has ensured that financial indicators such as capital ratios remain stable. This policy allocates funds for employee education and training, interbank fund placement, the calculation of collateral values taken as a reduction in minimum capital requirements from core capital, and the establishment of provisions for productive asset write-offs. To prevent misuse, prudential principles and risk management are maintained when implementing the relaxation policy. Furthermore, after the stimulus period ends, rural banks (BPR) and rural banks (BPRS) must ensure that the implementation of this policy is accompanied by adequate anticipatory measures and preparations to return to compliance with statutory requirements (OJK, 2021).

Based on the background outlined above, the gap phenomenon indicates that although rural banks (BPR) and rural banks (BPRS) play a crucial role in supporting MSMEs at the regional level, the industry's capital condition has become increasingly vulnerable during the pandemic. Nearly 24.1% of rural banks (BPR) have not met the Minimum Core Capital (MIM), while small-capital BPRs experience higher credit risk, lower efficiency, and a tendency to incur losses. Pressures intensified when the COVID-19 pandemic drastically reduced economic activity, particularly in Bali, the region with the deepest economic contraction in Indonesia due to its heavy reliance on the tourism sector. Amid these pressures, the Financial Services Authority (OJK) relaxation policy maintained temporary stability but did not immediately improve capital fundamentals. In reality, industry trends show a decline in the number of BPRs, increased consolidation, and the dependence of small BPRs on high funding costs and unfavorable market structures. This condition indicates that the capital strength of BPRs is influenced not only by external pressures such as the pandemic, but also by the bank's internal structure, such as profitability, operational

efficiency, bank size, and the market structure it faces. However, to date, there is no comprehensive empirical understanding of how the combination of external (COVID-19) and internal factors affects rural bank capital, particularly in regions with very different economic characteristics. Furthermore, Java, as the national economic center, and Bali, the region most impacted by the pandemic, face different structural pressures. Yet, research specifically comparing rural bank capital responses in these two regions remains very limited. This phenomenon highlights an empirical gap and an urgent need to reexamine the determinants of rural bank capital within the context of geography and crisis conditions. This research is also to fill**research gap**in literatureThe findings indicate that the influence of the COVID-19 pandemic, regional factors, market concentration, profitability, operational efficiency, and bank size on capital adequacy ratios (CAR) remains inconsistent. Therefore, this study seeks to provide new empirical evidence through an analysis of rural banks (BPRs) in the Java-Bali region. A summary of the research gap is presented in the following table.

Table 1. Research Gap

No	Research Title	Researcher (Year)	Key Findings	Research Objects / Samples
1	Financial stability in Indonesian Islamic banking using Z-Score: Before and during Covid-19	Alfiyan et al. (2023)	In the pre- and post-pandemic periods, variables such as BOPO, NPF, HHI, and several external indicators did not differ significantly; however, bank size and the BI-Rate showed average differences, suggesting that bank size and macroeconomic factors may have a greater influence on stability than efficiency/competition.	13 commercial Islamic banks in Indonesia from the first quarter of 2019 to the fourth quarter of 2020
2	The Efficiency of Indonesian Commercial Banks	S. Sari (2022)	This study demonstrates the relationship between efficiency, market structure, capital (CAR), NPL, LDR, and bank size; confirming that efficiency and market structure need to be taken into account in CAR analysis.	Indonesian commercial banks (panel data)
3	Market Concentration, Bank Characteristics, and Performance: Evidence from Indonesian Banking	Zahrah (2022)	Using HHI and concentration ratio to test the structure shows that the market structure (concentration) of the Indonesian banking sector is high (oligopoly), but the relationship between structure (HHI) and profitability (ROA) varies, creating ambiguity in the implications of structure on performance/capitalization.	Indonesian Banks (2010–2019)
4	Exploring the Determinants of Capital Adequacy in Commercial Banks: A Study of Bangladesh's Banking Sector	Naoaj (2023)	The finding that leverage and liquidity risk negatively affect CAR, while profitability and macroeconomic conditions (GDP) have a positive effect; bank size shows a negative correlation with CAR in several specifications, suggesting that large banks may have difficulty maintaining a high CAR.	28 commercial banks in Bangladesh (2013–2019)
5	Credit Risk and Financial Performance of Commercial Banks: Evidence from Vietnam	Ha Nguyen (2023)	Finding that bank size and non-performing loan ratio (NPLR) have a significant negative impact on profitability (ROA and ROE), but CAR is not proven to significantly affect performance, indicating that capital (CAR) does not always guarantee stability or profitability during periods of crisis/uncertainty.	26 commercial banks in Vietnam (2006–2016)
6	The Influence of Capital Adequacy Ratio (CAR),	Diantini (2020)	Showing that CAR has a positive and significant effect on ROA; while BOPO has a significant negative effect on ROA, implying	31 banking companies in Indonesia (2015–

	Operational Efficiency (BOPO), Business Risk and LDR on Financial Performance (ROA) of Banking in Indonesia		that the combination of capital and operational efficiency is important in determining bank performance.	2017) listed on the IDX
7	Analysis of Capital Adequacy Ratio (CAR) Efficiency and Bank Technical Efficiency	Francisca (2025)	The results show that although the average technical efficiency of banks is relatively high (86%), there is still room for improvement in capital and asset management implying that efficiency alone is not enough without adequate capital policies and good asset/liability management.	Commercial banks (non-specific research period, across banks)
8	The Influence of Efficiency, Market Structure, and Capital on the Stability & Performance of Islamic Banks in Indonesia	Widarjono et al. (2024)	In the context of Islamic banking, bank-specific variables (assets, equity, efficiency) and several external variables are analyzed in relation to profitability. The results indicate that financing diversification, bank size, and efficiency play important roles, but their relative impact on CAR has not been sufficiently evaluated, especially during a crisis period such as the pandemic.	BPRS in Indonesia (modern research period)

Source: Previous research, processed

Much of the literature demonstrates a relationship between efficiency, profitability, bank size, and bank stability/performance, and some incorporate CAR into the model. However, results vary widely, ranging from a positive effect of CAR on profitability/stability to no effect at all, or even a negative effect when the bank is large. Furthermore, market structure variables (concentration) and regional characteristics (geography) are rarely combined with CAR as the dependent variable. Even in crisis contexts such as the pandemic, studies evaluating CAR as an outcome are very few, and if any, they generally use samples of large or commercial banks, not rural banks (BPR/BPRS). Consequently, comprehensive empirical evidence is lacking on the factors influencing CAR in rural banks (BPR/BPRS) in a heterogeneous region like Java-Bali during the crisis. This study attempts to fill this gap.

This study is novel because it specifically examines the influence of the COVID-19 pandemic, Bali's geographic region, market concentration, profitability (ROA), operational efficiency (BOPO), and bank size on the capital adequacy ratio (CAR) of rural banks (BPRs) in the Java-Bali region. This study is significant because previous research has shown inconsistent results regarding the determinants of CAR and is very limited in simultaneously incorporating the pandemic, regional characteristics, and market structure variables into a single model.

Furthermore, this study makes a novel contribution by comparing rural banks (BPRs) in two regions with very different economic characteristics: Java, the center of national economic activity, and Bali, which relies heavily on the tourism sector, resulting in a richer empirical perspective. The use of panel data from 2019 Q4 to 2024 Q4 allows for a more comprehensive analysis that captures capital dynamics before, during, and after the pandemic. This research not only expands the literature on the determinants of BPR capital adequacy, but also offers relevant contextual evidence for regulators and the industry regarding BPR capital resilience during times of crisis and economic recovery.

FORMULATION OF THE PROBLEM

The capital adequacy ratio is a key indicator of bank health, crucial for facing crises such as the pandemic. Differences in the characteristics of Java and Bali, along with factors such as market concentration, profitability, efficiency, and the size of rural banks (BPRs), are thought to influence BPR capital responses to pressures posed by the COVID-19 pandemic. Therefore, the research questions are:

1. Does the Covid-19 pandemic period have an impact on the capital of BPRs in the Java-Bali region?
2. Is there an influence of Bali's geographical area factors on BPR capital in the Java-Bali region?
3. Is there an influence of market concentration on BPR capital in the Java-Bali region?
4. Is there an influence of profitability on BPR capital in the Java-Bali region?

5. Is there an influence of Bali's geographical efficiency factor on BPR capital in the Java-Bali region?
6. Is there an influence of bank size factors on BPR capital in the Java-Bali region?

LITERATURE REVIEW

The Impact of the Covid-19 Pandemic on Capital Performance

The pandemic period in Indonesia was marked by President Joko Widodo announcing the first two cases of COVID-19 in Indonesia on March 2, 2020, which marked the official start of the pandemic in the country. On June 1, 2023, President Joko Widodo officially revoked the COVID-19 pandemic status in Indonesia and announced that Indonesia had entered an endemic period, based on the decline in cases and the strengthening of the health system. The COVID-19 pandemic had a significant impact on increasing NPL values and negative CAR values for commercial banks in Bangladesh (Barua and Barua, 2021). A negative relationship was also found between the crisis period and CAR of banks in the East Asian region (Ahmad and Albaity (2019). In Indonesia, Mulyati et al. (2022) in their study stated that the Covid-19 pandemic had a positive impact on CAR but a negative impact on ROA. Another study conducted by Risfandy et al. (2022) showed that the Covid-19 pandemic had a negative impact on ROA and ROE. Meanwhile, a study conducted by Ayub et al. (2021) showed that profitability did not have a significant impact on CAR during the Covid-19 pandemic period. Therefore, this study has the following hypothesis:
H1: The Covid-19 pandemic has a negative impact on the capital performance of BPRs in the Java-Bali region.

Geographical Location on Capital Performance

The Java-Bali region is where the majority of rural banks (BPRs) in Indonesia operate, resulting in a high level of competition in the BPR industry. This is also supported by data from the 2020 Population Census, which shows that the Java-Bali region has 155,908,666 people, or 57.7% of Indonesia's total population. Java has a diverse economic sector, while Bali is a region whose economy is heavily supported by the tourism sector, which has been severely impacted by the COVID-19 pandemic. This is expected to impact the performance of BPRs as one of the ecosystems that provide capital to economic actors in the Bali region. Therefore, this study further hypothesizes:
H2: The geographical location factor of Bali has a negative influence on the capital performance of BPRs in the Java-Bali region.

Profitability Against Capital Performance

Profitability is a fundamental aspect that must be maintained for the sustainability of a rural bank (BPR) business. Increasing profitability can increase the amount of capital it holds. Previous research by Ahmad & Alabaity (2019) showed that bank income has a positive impact on bank capital levels. Alkhazali et. al. (2024) also showed a positive and resilient relationship between bank capital and profitability. A study by Mateev et. al. (2024) showed different results between the relationship between capital and profitability: a positive relationship for the relationship between capital and profitability measured using ROE, and a negative relationship for the relationship between capital and profitability measured using net interest margin. Another study by Risfandi & Pratiwi (2022) also showed a positive relationship between profitability and BPR capital. The explanation above indicates that this study has the following hypothesis:

H3: Profitability has a positive influence on the capital performance of BPRs in the Java-Bali region.

Efficiency on Capital Performance

By implementing efficiency measures, rural banks (BPRs) can minimize costs and improve their financial performance. Previous research, by Ayub et al. (2021), showed that inefficiency measured using BOPO significantly impacted CAR, with a negative effect. This aligns with the initial theory and hypothesis of the study, which claimed that a higher BOPO could erode a company's capital, or a higher BOPO would reduce CAR. Further research by Mateev et al. (2024) demonstrated that efficiency has a very strong and positive relationship with a bank's capital. Therefore, the hypothesis of this study is:
H4: Efficiency has a negative influence on BPR capital in the Java-Bali region.

Size on BPR Capital Performance

Previous research has shown that bank size significantly impacts rural bank capitalization. This is similar to research by Ahmad & Albaity (2019), which showed that bank size has a positive and significant impact on capital ratios. Large banks tend to maintain good ratings, therefore, they will hold capital reserves exceeding those determined by the market. Research conducted by Alkhazali et al. (2024) shows that bank performance during the

pandemic, including capitalization, is positively correlated with bank size. Meanwhile, research by Mulyati et al. (2022) shows a different result, showing a negative relationship between size and capitalization. This negative relationship is also confirmed by Mateev et al. (2024), where the impact of bank size is negative. These findings contradict the assumption that the traditional intermediation-based banking business model not only ensures adequate profitability but also depletes the bank's capital base. Therefore, the proposed hypothesis in this study is:

H5: BPR size has a negative influence on BPR capital in the Java-Bali region.

Market Concentration on Capital Performance

The type of bank in Indonesia that has a fairly large number is the BPR. A region can have several BPRs, each competing with another to attract customers. This will certainly affect BPR performance. In a study conducted by Mateev et. Al (2024), the level of market concentration has a negative relationship with the bank's capital ratio. Furthermore, a study conducted by Amanda (2023) on BPRs in Indonesia explained that a more concentrated market (lower competition) results in inefficiency. Therefore, the hypothesis of this study:

H6: Market concentration has a negative influence on the capital performance of BPRs in the Java-Bali region.

THEORETICAL FRAMEWORK

Based on several references from the literature review, the following is the research framework below..

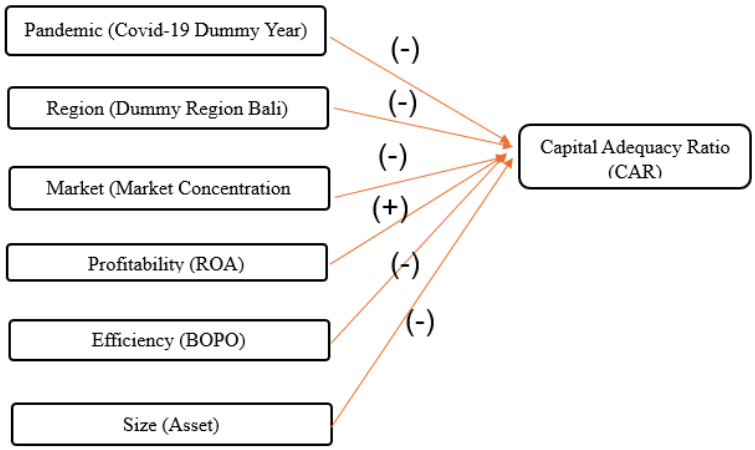

Figure 1. Framework of Thought

RESEARCH METHODS

Types and Sources of Research Data

This study employs a descriptive quantitative research design to test specifically defined hypotheses, with the goal of identifying relationships between the studied variables. To achieve this objective, quantitative methods were used to analyze the research data. The data analyzed in this study covers rural banks (BPR) and rural banks (BPRS) operating in Indonesia. The financial reports of the BPR and BPRS were obtained from the official website of the Financial Services Authority (OJK), which acts as a regulator and supervisor of the financial services sector in Indonesia.

Population and Sample

Every rural bank operating in the Java-Bali region constitutes the study's population. Stratified random sampling was used in this study. This sampling method selects units to be observed based on the researcher's opinion of which is most useful or representative (Babbie, 2009). This study used a sample of 180 rural banks in the Java-Bali region, from Q4 2019 to Q4 2024.

Method of collecting data

The data used in this study is secondary data.The data was obtained from BPR financial reports to the OJK as the authority that supervises financial services companies in Indonesia.

Data Analysis Techniques

This study employed a quantitative analysis approach by applying panel data regression methods. Data processing and analysis were performed using EViews software, which included selecting the best model (Common Effect, Fixed Effect, Random Effect), followed by the Chow test, the Hausman test, and the Lagrange Multiplier test to determine the most appropriate model. Furthermore, the study also conducted classical assumption tests, including multicollinearity, heteroscedasticity, and autocorrelation tests, as well as model feasibility tests using the F-test, t-test, and coefficient of determination (R^2). This approach allows for a more accurate analysis of the impact of the COVID-19 pandemic and BPR internal variables on capital adequacy (CAR) during the study period.

RESEARCH RESULTS AND DISCUSSION

Research result

Descriptive Data

Descriptive statistical analysis was conducted to describe the characteristics of the research data, which comprises the variables CAR, Covid, Bali, ROA, BOPO, Log(Assets), and Log(HHI). Statistics were calculated from 3,780 observations, representing panel data from 180 rural banks (BPRs) during the period Q4 2019–Q4 2024.

Table 2. Descriptive Statistics

Statistics	CAR	COVID	BALI	ROA	BOPO	LOG(NEW ASSETS)	LOG(HHI)
Mean	37,2268	0.6667	0.1667	1,2006	93,7409	24,9203	6,0364
Median	33,9400	1,0000	0.0000	1,6000	88,6250	24,8035	6,0628
Maximum	135,3600	1,0000	1,0000	14,5900	861,3500	28,2166	10,1451
Minimum	-571,6200	0.0000	0.0000	-389,7600	49,1800	21,9074	4,7887
Std. Dev.	22,0618	0.4715	0.3727	8,9313	38,7548	1,1276	0.8780
Skewness	-7.6596	-0.7071	1,7889	-32,5915	2,3400	0.4162	1,1825
Kurtosis	217, 2014	1,5000	4,2000	1297.2770	217,2212	2,5651	6,0075
Jarque-Bera	7263416	669	2243	265000000	7323720	139	2306
Probability	0	0	0	0	0	0	0
Sum	140717.1	2520	630	4538.14	354340.4	94198.66	22817.44
Sum Sq. Dev.	1839322	840	525	301444.4	5675820	4804,742	2913.41
Observations	3780	3780	3780	3780	3780	3780	3780

1. Capital Adequacy Ratio (CAR)
   The average CAR of 37.23%, with a median of 33.94%, indicates that most rural banks (BPRs) have relatively strong capitalization. The maximum value was recorded at 135.36%, while the minimum reached -571.62%, indicating a wide range of variation. The very negative skewness and very high kurtosis values indicate an uneven distribution of CAR and numerous extreme values. This is consistent with the results of the Jarque-Bera (JB) test, which indicates a non-normal distribution.
2. Covid Variable (Dummy)
   The average for the Covid variable was 0.6667, meaning approximately two-thirds of the study period fell during the pandemic. The maximum and minimum values correspond to the dummy definition (1 and 0). The distribution of this variable is non-normal, as indicated by the significant Jarque-Bera p-value.
3. Bali Dummy Variable
   The variable's average value of 0.1667 corresponds to the proportion of rural banks (BPRs) in Bali Province (30 out of 180 BPRs). Skewness and kurtosis values indicate an uneven distribution of this variable, as most observations come from provinces outside Bali.
4. Return on Assets (ROA)
   The average ROA was 1.20%, indicating generally positive profitability. The ROA range was very wide, with a minimum of –389.76% and a maximum of 14.59%, indicating significant differences in profitability performance across rural banks. Very high skewness and kurtosis values indicate the ROA distribution contains many extreme values, and the JB test confirmed the distribution's non-normality.
5. BOPO (Operating Expenses to Operating Income)
   The average BOPO was 93.74%, approaching the industry's general efficiency limit. The minimum value of 49.18% and the maximum value of 861.35% indicate a wide range of efficiency variations. High skewness and kurtosis values indicate that many values are significantly far from the average.

6. Logarithm of Total Assets (Log Assets)
   The average Log(Assets) value is 24.92, with a range between 21.91 and 28.22. This variable shows significant variation in BPR size. Compared to other variables, the distribution of Log(Assets) is closer to normal, although the Jarque-Bera test still shows non-normal results.
7. Logarithm of HHI (Market Concentration Level)
   The average Log(HHI) of 6.04, with a range of 4.79 to 10.15, reflects variations in the level of BPR market concentration across regions. Higher-than-normal skewness and kurtosis values indicate values located far from the center of the distribution.

Panel Data Regression Selection

In this study, the panel regression model was selected based on data characteristics and previous test results. The Fixed Effects model could not be used because the structure of the Bali region dummy variable and the Covid dummy variable resulted in a matrix condition that did not meet the requirements for applying the FE (near singular matrix). Furthermore, the FE model cannot accommodate certain time-invariant variables in the context of this study. Therefore, this study only considered two possible models: the Common Effects Model (CEM) or the Random Effects Model (REM). Therefore, the best model was selected using the Lagrange Multiplier Test (Breusch–Pagan LM Test), which is specifically used to compare whether the Random Effects model is more appropriate than the Common Effects model.

Lagrange Multiplier Test

The Lagrange Multiplier test was conducted to determine whether the Random Effect model is more appropriate than the Common Effect model. The test hypothesis is as follows:

H_0 : The Common Effect Model is more appropriate (no individual effect or time effect)

H_1: The Random Effect Model is more appropriate (there is an individual effect or time effect)

The results of the LM test are shown in the following table:

Table 3. Lagrange Multiplier Test

Component	Breusch-Pagan LM	Probability
Cross-section	15,670.79	0.0000
Time	138.49	0.0000
Both	15,809.28	0.0000

All probability values were <0.05, thus rejecting the null hypothesis for all three categories (cross-section, time, and combined). Thus, the test results consistently indicate that the Random Effects model is more appropriate for this study. Consequently, variations between entities (BPR) and over time significantly influence the dependent variable, enabling the REM model to better capture this heterogeneity than the CEM model.

Classical Assumption Test

Normality Test

The results of the regression normality test are presented as follows.

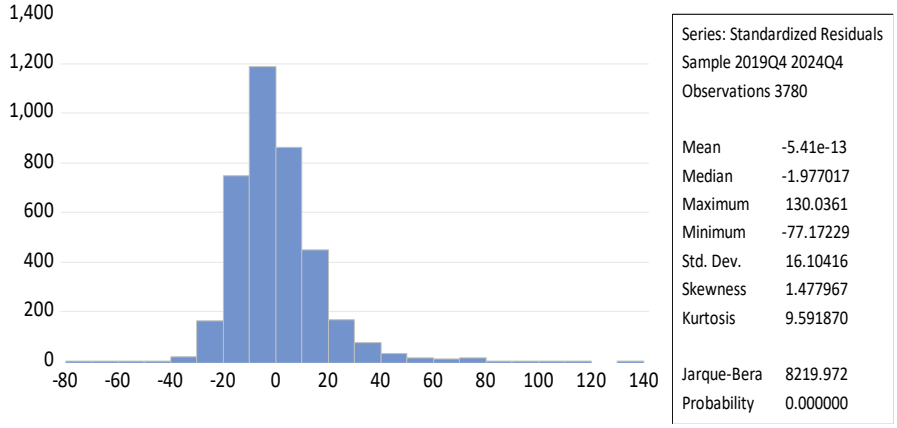

Figure 2.Normality Test

The JB test results show a p-value of 0.0000, indicating that the residuals do not follow a normal distribution. This non-normality is common in financial data and is not a major issue in panel regression, as the REM estimator does not require residual normality to produce consistent estimators.

Panel Data Analysis

After the best model was determined using the Lagrange Multiplier (LM) test, which concluded that the Random Effects Model (REM) was the most appropriate, the next step was to conduct a panel regression estimation to determine the effect of Covid, Bali, ROA, BOPO, Log(Assets), and Log(HHI) variables on the Capital Adequacy Ratio (CAR). The estimation was performed using the random effects method. The complete regression results are presented in the following table:

Table 4. Panel Regression Estimation Results (Random Effect)

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	239,1636	14,3433	16,6742	0.0000
COVID	-1.25176	0.343212	-3.64718	0.0003
BALI	2.03904	2.622212	0.777603	0.4369
ROA	1.321257	0.023794	55.52839	0.0000
BOPO	-0.03315	0.006485	-5,11071	0.0000
LOG(ASSET)	-7,8989	0.558813	-14,1351	0.0000
LOG(HHI)	-0.51002	0.337657	-1.51048	0.1310
R-squared			0.5722	
Adjusted R-squared			0.5715	
F-statistic			841,0796	

t-Test (Partial)

The t-test results show that several variables have a significant effect on CAR at the 5% significance level, while others are insignificant. The interpretation of each coefficient is as follows:

1. Covid
   The Covid variable shows a coefficient of –1.2518, with a probability value of 0.0003 (<0.05). This means that during the Covid period, CAR decreased by an average of 1.25 points compared to the non-pandemic period. A probability value of 0.0003 indicates that this variable is significant at the 5% level.
2. Bali
   The Bali variable shows a coefficient of 2.0390, with a probability value of 0.4369 (>0.05). This means that being a BPR located in Bali does not significantly impact CAR. The probability value of 0.4369 indicates that this variable is not significant at the 5% level.
3. ROA
   The ROA variable shows a coefficient of 1.3213, with a probability value of 0.0000 (<0.05). This means that every 1-point increase in ROA increases CAR by 1.32 points. A probability value of 0.0000 indicates that this variable is significant at the 5% level.
4. BOPO
   The BOPO variable shows a coefficient of –0.0331, with a probability value of 0.0000 (<0.05). This means that every 1-point increase in BOPO decreases CAR by 0.033 points. A probability value of 0.0000 indicates that this variable is significant at the 5% level.
5. Log(Asset)
   The Log(Assets) variable shows a coefficient of –7.8989, with a probability value of 0.0000 (<0.05). This means that when the size of the BPR increases (a 1-unit increase in log assets), the CAR decreases by an average of 7.90 points. A probability value of 0.0000 indicates that this variable is significant at the 5% level.
6. Log(HHI)
   The Log(HHI) variable shows a coefficient of –0.5100, with a probability value of 0.1310 (>0.05). This means that the level of market concentration has no significant effect on CAR. The probability value of 0.1310 indicates that this variable is not significant at the 5% level.
7.

F Test (Simultaneous)

The F-test showed an F-statistic value of 841.0796, with a probability value of 0.0000 (<0.05). This means that all independent variables together have a significant effect on CAR. A probability value of 0.0000 indicates that the regression model is significant at the 5% level, so Covid, Bali, ROA, BOPO, Log(Assets), and Log(HHI) are able to simultaneously explain variations in CAR in the model.

Goodness of Fit Test

The R-squared value of 0.5722 indicates that 57.22% of the variation in CAR can be explained by the variables Covid, Bali, ROA, BOPO, Log(Assets), and Log(HHI) in the model. Meanwhile, the Adjusted R-squared value of 0.5715 indicates a relatively stable model fit, even considering the number of variables. Thus, the model has strong explanatory power, as more than half of the variation in CAR can be explained by the variables in the study.

DISCUSSION OF RESEARCH RESULTS

The Impact of Covid on the Capital Adequacy Ratio (CAR)

The results of the study indicate that the Covid-19 period has a negative relationship with the capital level of rural banks (BPRs), as represented by CAR. This finding is consistent with the first hypothesis (H1), which states that the pandemic puts significant pressure on BPRs' capital resilience. This can be explained through several mechanisms discussed in the theoretical framework. The Covid-19 pandemic, as a global macroeconomic shock, triggered a decline in asset quality, increased credit risk, and restrictions on economic activity, leading to a slowdown in debtor cash flows. These conditions increase the potential for an increase in non-performing loans while reducing banks' capacity to build internal capital reserves. The decline in CAR during the pandemic also aligns with the Buffer Capital Theory, which explains that banks require capital as a buffer to absorb risk during economic shocks. In the context of the pandemic, this buffer was eroded as rural banks (BPRs) faced simultaneously increased credit and operational risks. Because BPRs rely on local funding sources and have limited ability to mobilize external capital, the pandemic pressures tended to be more severe than those experienced by commercial banks. Previous research supports these findings. Ahmad & Albaity (2019) showed that banks face capital impairment during periods of economic stress. Risfandy et al. (2022) concluded that the pandemic pressured the profitability and resilience of rural banks (BPR), which ultimately impacted capital. Tien Pham & Nugroho (2022) also noted that Bali and its surrounding areas experienced profound economic pressure due to a decline in tourism, reducing the ability of local financial institutions to maintain stability. Thus, the findings of this study are empirically consistent with risk theory, research hypotheses, and prior evidence. The COVID-19 period significantly reduced rural banks' ability to maintain capital, reflecting the industry's high sensitivity to macroeconomic conditions.

The Influence of Bali's Regional Location on CAR

The Bali dummy variable did not show a significant effect on CAR. This finding suggests that being a rural bank operating in Bali does not lead to systematic differences in capital levels compared to rural banks in other regions in this study. This result does not support the second hypothesis (H2) formulated in Chapter III, which hypothesized that rural banks in Bali experienced greater pressure due to the pandemic and its tourism-based economic structure. Chapter II explains that Tien Pham & Nugroho (2022) found that Bali was one of the regions most impacted by the drastic decline in mobility and economic activity. Furthermore, Anwar et al. (2021) found differences in efficiency between regions, including between Java and Bali. However, not all differences in regional performance translate directly into differences in capital. The results of this study indicate that rural banks in Bali are still able to maintain CAR stability through risk management mechanisms and internal policies, so that geographic differences do not directly determinant capital variations. In other words, location factors do not significantly influence CAR after other variables such as efficiency, profitability, and bank size are taken into account. This is consistent with the view that internal bank factors are more dominant than geographic factors in determining capital resilience.

The Influence of Profitability (ROA) on CAR

Profitability, as measured by ROA, has been shown to be a factor that consistently increases CAR. This finding supports the third hypothesis (H3), which states that ROA has a positive influence on BPR capital. Theoretically, this aligns with Buffer Capital Theory, which emphasizes that profit is a key component in the formation of a bank's internal capital. Banks with higher profitability have a greater capacity to set aside retained earnings as additional capital, thus strengthening the capital ratio.

In Chapter II, Ahmad & Albaity (2019) emphasized that profitability is a strong determinant of bank capital decisions, as more profitable banks tend to have better capital buffers. Risfandy & Pratiwi (2021) also found a positive relationship between profitability and CAR in Islamic rural banks. Research by Mulyati et al. (2022) emphasized the crucial role of management performance in strengthening the financial condition of small banks. The results of this study confirm that profitability is a fundamental indicator in maintaining the capital resilience of rural banks (BPRs). BPRs that are able to generate stable profits will have a greater ability to meet minimum capital requirements and maintain stakeholder trust.

The Effect of Operational Efficiency (BOPO) on CAR

The BOPO variable, which reflects a bank's efficiency level, shows a negative relationship with CAR. The higher the BOPO ratio, the lower the efficiency level, which implies a reduced ability of the bank to maintain capital. This finding aligns with the fourth hypothesis (H4), which states that efficiency negatively impacts CAR. This negative relationship is also in line with the Efficiency Hypothesis, which states that operational efficiency is a critical determinant of a bank's financial health. Inefficiency leads to significant operating expenses, reduces profits, and suppresses the bank's ability to strengthen capital through the accumulation of retained earnings. Previous research cited in Chapter II supports this finding. Mulyati et al. (2022) explain that efficiency is a key factor influencing bank stability. Anwar et al. (2021) also emphasize that inefficiency can worsen the financial condition of rural banks (BPRs), especially those with limited asset scale. Therefore, operational efficiency is one of the most crucial aspects of BPR management. Banks that are able to manage costs effectively tend to have stronger CAR, as they have greater room to maintain or increase capital.

The Effect of Bank Size on CAR

Bank size, measured by the logarithm of total assets, shows a negative relationship with CAR. This finding supports the fifth hypothesis (H5), which states that bank size negatively influences CAR. In the context of rural banks (BPR), larger banks do not necessarily have stronger capital. Conversely, aggressive asset growth, particularly through credit expansion, often increases risk and puts pressure on bank capital. In Chapter II, Ahmad & Albaity (2019) showed that bank size and leverage correlate with capital resilience, with larger banks tending to use higher leverage, resulting in relatively lower CAR. Risfandy et al.'s (2022) findings also indicate that pressure on bank performance is greater for banks growing rapidly without a corresponding increase in capital. These results suggest a trade-off between asset growth and capital stability, where too rapid expansion can disrupt capital balance. This finding is particularly relevant for the rural bank (BPR) industry, as BPRs are limited in raising external capital and rely more heavily on internal capital formation.

The Effect of Market Concentration on CAR

Market concentration, as measured by the HHI index, did not significantly influence CAR. This indicates that the level of competition or market dominance is not a primary determinant of the capital resilience of rural banks in this study sample. This finding does not support the sixth hypothesis (H6), which assumes that market concentration influences capital. Previous research by Amanda (2023) showed that market concentration can affect rural bank efficiency, while Mateev et al. (2024) found a relationship between concentration and capitalization in the MENA region. However, the context of the Indonesian rural bank industry differs, as it tends to be highly fragmented. Regional variations in the HHI tend not to be large enough to create significant differences in CAR. Thus, market structure has not proven to be a significant factor in explaining changes in BPR CAR. Internal bank factors are far more dominant than the competitive structure in the local market.

CONCLUSION

This study aims to analyze the factors influencing the Capital Adequacy Ratio (CAR) of Rural Banks (BPR) in the Java–Bali region during the period Q4 2019–Q4 2024, using a Random Effects Model (REM) panel regression approach. The independent variables tested include Covid-19, Bali location, profitability (ROA), operational efficiency (BOPO), bank size (log assets), and market concentration (log HHI). The results show several key findings. First, Covid-19 has a negative relationship with CAR, confirming that the pandemic has put pressure on asset quality and the internal capital formation capacity of BPRs. These findings are consistent with Buffer Capital theory and the results of previous research in Chapter II. Second, the Bali location variable does not show a significant effect on CAR, indicating that geographic factors are not a major determinant of BPR capital strength after internal control variables are taken into account. Third, profitability (ROA) has a positive effect on CAR,

reinforcing the understanding that profit is the main source of internal capital strengthening in BPRs. Fourth, operational efficiency (BOPO) has a negative relationship with CAR, reflecting the important role of operational effectiveness in capital resilience. Fifth, BPR size shows a negative relationship with CAR, indicating a trade-off between asset expansion and capital strengthening. Finally, the market concentration variable (HHI) does not have a significant effect, indicating that the structure of local competition is not a major determinant of CAR variation in the highly fragmented BPR industry. The research findings confirm that internal factors of rural banks, particularly profitability, efficiency, and asset management, are the strongest determinants of maintaining and strengthening CAR. External factors, such as COVID-19, also showed a significant influence. Market structural and geographic factors were not found to be significant in this study.

RESEARCH LIMITATIONS

This study has several limitations. First, the analysis was conducted in a general manner across all rural banks (BPRs) without distinguishing specific characteristics such as ownership type, market segmentation, or BPR health level. Therefore, the internal dynamics between BPR groups are not fully captured. Second, the Covid-19 variable is measured using a dummy variable, thus only representing the aggregate impact of the pandemic, without capturing variations in intensity between waves or differences in impact between regions. Third, the high heterogeneity of the BPR industry in terms of size, location, and business model is not fully captured by the model. Fourth, the use of a Random Effects Model as a possible approach results in the inability to optimally estimate time-invariant characteristics between BPRs. However, these limitations do not diminish the validity of the results but instead open up opportunities for further, more in-depth and segmented research.

FUTURE RESEARCH AGENDA

Based on the limitations of this research, several directions for further research development can be carried out as follows:

1. A More Specific Approach to the Characteristics of BPR
   Future research could focus analysis on specific groups of BPRs, such as large and small BPRs, regional government-owned and private BPRs, or BPRs with different financing focuses (trade, agriculture, tourism). This approach allows for the identification of variations in capital behavior that cannot be captured when analyzing all BPRs in aggregate.
2. A More Detailed Measurement of the Impact of Covid-19
   Future research could use more specific indicators of pandemic intensity, such as the number of cases, mobility levels, PPKM indicators, or the separation between pandemic waves. These more granular measurements could provide a more accurate picture of the differences in the impact of Covid-19 on rural bank capital across regions and periods.

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