# “The impact of COVID-19 on bank stability: Do bank size and ownership matter?”


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| **ARTICLE INFO** | Siti Maria, Rizky Yudaruddin and Yanzil Azizil Yudaruddin (2022). The impact of COVID-19 on bank stability: Do bank size and ownership matter?. *Banks and Bank Systems*, *17*(2), 124-137. doi:10.21511/bbs.17(2).2022.11 |
| **DOI** | http://dx.doi.org/10.21511/bbs.17(2).2022.11 |
| **RELEASED ON** | Monday, 27 June 2022 |
| **RECEIVED ON** | Sunday, 20 March 2022 |
| **ACCEPTED ON** | Monday, 30 May 2022 |





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|---|---|
| **JOURNAL** | "Banks and Bank Systems" |
| **ISSN PRINT** | 1816-7403 |
| **ISSN ONLINE** | 1991-7074 |
| **PUBLISHER** | LLC “Consulting Publishing Company “Business Perspectives” |
| **FOUNDER** | LLC “Consulting Publishing Company “Business Perspectives” |

| NUMBER OF REFERENCES | NUMBER OF FIGURES | NUMBER OF TABLES |
|---|---|---|
| 67 | 0 | 8 |

BUSINESS PERSPECTIVES

LLC "CPC "Business Perspectives"
Hryhorii Skovoroda lane, 10,
Sumy, 40022, Ukraine

www.businessperspectives.org

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# THE IMPACT OF COVID-19 ON BANK STABILITY: DO BANK SIZE AND OWNERSHIP MATTER?

## Abstract

During the COVID-19 pandemic, bank stability became a priority for the Indonesian Financial Services Authority and the government. Economic activity is expected to be restored by muffling the shocks caused by the COVID-19 outbreak. This paper investigates the influence of COVID-19 on banking stability by differentiating bank core capital size and ownership. Using data from 108 commercial banks in Indonesia for the period March 2020 and March 2021, the paper analyzes data using fixed effects regression. The results show that COVID-19 has a detrimental and significant effect on bank stability in Indonesia. Regardless of the size and ownership of a bank's core capital, it was found that no bank is immune for a year to the severe implications of COVID-19. This condition was experienced by both state banks and private banks, large and small. To assist in the absorption of COVID-19 shocks, this paper proposes policies for regulators that include stimulus packages and countercyclical roles in the banking system via government-owned banks.

**Keywords** health, financial institutions, risk, size, government, private

**JEL Classification** G20, G32, E42

**Received on:** 20th of March, 2021
**Accepted on:** 30th of May, 2022
**Published on:** 27th of June, 2022



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**Conflict of interest statement:**
Author(s) reported no conflict of interest

## INTRODUCTION

The 2019 Corona Virus Disease (COVID-19) pandemic has had a tremendous impact on the dynamics of the world economy 2020, including Indonesia. This situation leads to a health and humanitarian crisis, as well as an economic catastrophe and an increase in poverty in several countries. The establishment of migration restriction regulations to minimize the spread of COVID-19 seemed ineffective to prevent this unfavorable outcome for the global economy.

Indonesia has surpassed India, which has been able to flatten its COVID-19 transmission curve, as the country with the most active COVID-19 cases in Asia. Based on Worldometers data as of Tuesday (2/1/2021), Indonesia has 175,349 active cases, while India only has 164,278 active cases. The number of patients who have tested positive for Virus COVID-19 is known as active cases. Indonesia also ranks first with most of the amount of confirmed cases in Southeast Asia and 19th with the amount of confirmed cases at the global level.

The government of Indonesia has made numerous efforts to combat the epidemic of COVID-19. The government has strengthened the policy mix to ensure economic stability and promote economic recovery that was suppressed due to the impact of the epidemic of COVID-19. In this context, the policy direction of the Central Bank of Indonesia is placed on the conception of a close relationship that is complementary and mutually reinforcing between economic growth and stabil-



http://dx.doi.org/10.21511/bbs.17(2).2022.11

ity, including financial system stability. Policy responses will continue to be directed at maintaining economic stability, particularly external stability, which was subject to considerable pressure due to uncertainty on global financial markets. Policies are also directed at ensuring financial system stability, including safeguarding bank stability.

Indonesian banking has a pivotal role in the performance and stability of global banking. This is because it outweighs that of Asia-Pacific's banking industry, which also outperformed global banking for many years in terms of profitability (Dahl et al., 2019). Specifically, the return on average equities (ROAE) in Indonesian banking reached 13.2% in 2018, while ROAE in banking in the Asia-Pacific region, including developed and emerging markets, only had 10.1% on average. In this regard, Indonesian banking may affect global banking stability. As a result, it is critical to examine the COVID-19 pandemic's influence on Indonesian banking stability.

State-owned banks have a reputation for taking on more risk. As a consequence, shareholders will not face the full weight of adverse outcomes, as the government will shoulder the expense of extravagant risk-taking. Meanwhile, large capital will help bigger banks mitigate the negative effects that happened during the crisis.

## 1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

COVID-19 pandemic has certainly given a more depressing impact on the economic sector and financial system worldwide, compared to the situation when Global Financial Crisis (GFC) happened during 2008–2009. As this pandemic spread, every region has been subjected to substantial growth downgrades and economic uncertainty. Baldwin and di Munro (2020) demonstrate the impact of COVID-19 on the G7 countries, which account for approximately 60% of global supply and demand GDP, including 65% of global manufacturing. Lestari et al. (2021) and Riadi et al. (2022) demonstrate that COVID-19 has a negative effect on small companies. McKibbin and Fernando (2020) demonstrate that while the COVID-19 upheaval persists, GDP growth drops across economies internationally. These downturns have increased the banking sector's systemic vulnerability, leading to a new financial crisis (Rizwan et al., 2020). As a result of the high level of uncertainty surrounding the epidemic and the resulting economic setbacks, the stock market has grown exceedingly unpredictable and volatile in recent years (Baker et al., 2020; Ali & Rizvi, 2020; and Zhang et al., 2020), and consequently, there is more economic uncertainty, which increases bank risk (Wu et al., 2020).

Much of the existing works on the epidemic of COVID-19 indicate that COVID-19 has a significant impact on the financial systems. A rising empirical corpus of COVID-19 literature has impacted stock returns and market responses. K. J. Heyden and T. Heyden (2020) and Schell et al. (2020) focus on the reactions of the financial market to COVID-19 using even study, find stocks react significantly negatively to the COVID-19 pandemic. A negative market reaction is more common in emerging market stocks than in developed market stocks, according to Salisu and Vo (2020). Throughout the COVID-19 era, Salisu and Vo (2020) also find that health news has a negative and statistically significant impact on stock performance. Erdem (2020) observes a rise in the quantity of COVID-19 cases on the weakening in stock returns is lower in countries with a high freedom index than in countries with a low freedom index. Narayan et al. (2020) discover a link between the negative return of the stock market and COVID-19-related government initiatives, such as stimulus packages, country lockdown, and travel prohibitions. Baek et al. (2020) and Alfaro et al. (2020) show that COVID-19 has had a significant impact on volatility and stock market return.

Meanwhile, many studies have been conducted to determine COVID-19's effect on stock returns. In a study of stock market returns from 64 nations, Ashraf (2020) discovers that total confirmed cases by COVID-19 have a decline on stock market

returns. Al-Awadhi et al. (2020) find that daily upsurges in the number of confirmed cases and fatalities from COVID-19 have a substantial negative effect on stock returns across all industries. Concentrating on developing stock markets, the detrimental effects of COVID-19 on inventory returns are found by Topcus and Gulal (2020). Mazur et al. (2020) examine the performance of the American stock market and conclude that the stock market reacts adversely to COVID-19, especially in the sectors of entertainment, oil, and hospitality. He et al. (2020) look into the Chinese stock market and discover that the pandemic has had a negative influence on the transportation, power and heating, mining, and environmental industries. Cepoi (2020) has a link to negative stock markets returns between COVID-19 news. The unfavorable connections between the pre-lockdown COVID-19 and the Vietnam stocks are indicated by Anh and Gan (2020).

Recently, the growing literature has focused on the role of COVID-19 in the banking sector. However, studies on the impact of the pandemic on banking stability are very limited. In financial systems, Rizwan et al. (2020) discover a significant rise in systemic risk during the COVID-19 period. Li et al. (2020) developed a model of the bank's capital stock option. They demonstrate that COVID-19 lowers the optimum margin of banks' interests, state injections enhance margins, and the outbreak and capital injections damage Shadow Banking's efficiency gain. As such, COVID-19 increases a bank's risk-taking propensity and thus adversely affects banking stability. Demirguc-Kunt et al. (2020) examine how COVID-19 impacted different conditions on stock return. Wu and Alson (2020) suggest that COVID-19 is negatively affected in the short term, as opposed to small-sized banks by the asset quality of public and joint-stock banks. Furthermore, in the long term, COVID-19 exerts a stronger downward impact on credit risks.

Indeed, the COVID-19 pandemic, which has lasted for over a year, has had an effect on the global economy. As a result, it is critical to investigate the impact of COVID-19 on bank stability. Using data from 1,090 banks in 116 countries from 2019 to 2020, Elnahass et al. (2021) discovered significant empirical evidence of the COVID-19 pandemic's negative impact on global bank stability. They also demonstrate that regional differences and bank characteristics have different effects on bank stability. Similarly, Ozsoy et al. (2020) investigate the impact of COVID-19 on bank stability in terms of geographic exposure and liquidity injection support. As a result of the spread of the COVID-19 outbreak, they discovered a decrease in bank stability. The presence of liquidity injection is thought to be capable of assisting the bank in increasing its ability to expand credit and bank stability. They also discovered a difference in the impact between locations with high levels of COVID-19 exposure and those with low levels of exposure.

The global financial crisis (2008–2009) has similarities to the COVID-19 pandemic because it has contagious financial and economic distress effects. Caballero and Simsek (2009) show that like a pandemic, the global financial crisis has a contagious impact. Aldasoro et al. (2020) highlight that COVID-19, as a pandemic illness, has a complex and diverse set of repercussions for banks and jeopardizes the financial system's stability. A huge number of scholarships show the different impacts of the global financial crisis (GFC) on banking stability, depending on bank size and ownership structure. Therefore, ownership structure and bank size are important in explaining bank risk (Barry et al., 2011; Iannotta et al., 2013). There are differences in the impact of the GFC on bank stability between large and small banks. Large banks are more stable than small banks (Berger & Bouwman, 2013; Varmaz et al., 2015; Vallascas et al. 2017; de Haan & Kakes, 2019). Meanwhile, government-owned banks are also more stable than private banks (Cornett et al., 2010; Kamarudin et al., 2016).

This study also analyzes various bank-specific and macroeconomic control factors as control variables. First, bank concentration (HHI) measures the Herfindahl-Hirschman index of banks' assets. The connection between financial stability and bank concentration was analyzed in various studies with two different views. The concentration-stability hypothesis assumes that a bank with a low ratio concentration is more susceptible to financial crisis/instability compared to those with a higher ratio of concentration (Tabak et al., 2012; Yeyati & Micco, 2007) and supports the competition-fragility (Berger et al., 2009; Beck et al., 2013;


http://dx.doi.org/10.21511/bbs.17(2).2022.11

Uhde & Heimeshoff, 2009). The second variable is the bank size (SIZE), where bigger banks are stable than small banks because they diversify better (Allen, 1990; Yusgiantoro et al., 2019).

The third variable is the proportion of total third-party funds held by banks to total assets (DEPO). Higher DEPO tends to increase bank liquidity. Directly, during a crisis, asset liquidity may assist banks in preserving stability and mitigating risk on their financial statements (Wagner, 2007). The fourth variable is the loan-to-value ratio of total assets (LTA). Credit expansion at a faster rate is risky for banks because of the decline in loan and collateral standards, especially when the loan is given excess (Foos et al., 2010). The fifth variable is the non-interest income divided by total assets (NII). Demirgüc-Kunt and Huizinga (2010) and Altunbas et al. (2011) reported an increase in non-interest income increased bank stability, particularly in small banks. The sixth variable is the ratio of operating expenses divided by operating income (OEOI). According to Berger and DeYoung (1997), Yusgiantoro et al. (2019), Fiordelisi et al. (2011), and Altunbas et al. (2007), inefficient banks take more risk and have higher capital.

Bond Yield is the seventh variable (OBL). Sovereign bond yields, according to von Borstel et al. (2016), have a bigger long-term impact than short-term loan rates. For their long-term financing with fixed interest rates to private non-banks, banks use long-term government bond yields as a benchmark (van Leuvensteijn et al., 2013). Banks that function as a proxy for banking risk or financing costs are subject to fluctuations in sovereign spreads via CDS (the credit default swap) (Zoli, 2013). Higher funding costs impede the accumulation of bank net worth in a bad equilibrium, resulting in a continuous reduction in investment and output (Ari, 2017). The exchange rate is the eighth variable (EXG). For most individual and systemic risk measurements, the impact of overseas expansion on risk is invariably negative and large, according to Faia et al. (2019). Market insecurity, trader income volatility, a rise in risk, inflation uncertainties, an unfavorable trade balance, and the implications of exchange-rate fluctuation on manufacturing and operation costs may all occur (Juhro & Phan, 2018). As a result, exchange rate flexibility can assist banks to protect themselves from funding and investment shocks (Eichengreen, 1998).

Based on a review and analysis of prior research, a significant body of literature has concentrated on COVID-19's function in the banking sector. However, research on the effect of pandemics on banking stability is quite scarce. Numerous researches indicate that COVID-19 has a detrimental effect on the economy, particularly the financial sector. As a result of the foregoing, the following are the study's objectives: This study aims to examine the impact of COVID-19 on bank stability in Indonesia by differentiating the various types of ownership banks and sizes associated with its core capital.

Further, this paper proposes the following hypotheses based on the literature review:

*H1: There is a negative impact of COVID-19 on bank stability.*

*H2: There are differences in the impact of COVID-19 on bank stability between large and small banks.*

*H3: There are differences in the impact of COVID-19 on bank stability between government-owned banks and private banks.*

## 2. METHOD

This study explores the effects of change in COVID-19 confirmed cases on bank stability in Indonesia. Data on bank-specific variables were collected from monthly financial reports of 108 commercial banks (including 11 Islamic banks) from the Indonesian Financial Services Authority (OJK/Otoritas Jasa Keuangan) between March 2020 and March 2021. The pandemic in Indonesia began with the confirmation of the first COVID-19 case in Indonesia on March 2, 2020 in the Ministry of Health's website (https://www.kemkes.go.id/).

Two dependent variables reflect bank stability (Z-Score). Following Yudaruddin (2022), Saif-Alyousfi et al. (2020), Yusgiantoro et al. (2019),

Lepetit and Strobel (2013), and Demirgüç-Kunt and Huizinga (2010), using the above formula, two Z-Score measurements were generated for bank $i$ at months of the year $t$:

$$ZROA = \frac{ROA_i + EQTA_{i,t}}{SDROA_i}, \quad (1)$$

$$ZROE = \frac{ROE_i + EQTA_{i,t}}{SDROE_i}, \quad (2)$$

where *ROA* and *ROE* refer to a bank's return on assets and equity from March 2020 and March 2021. *EQTA* is the ratio of total equity to total assets, while *SDROA* and *SDROE* are the standard deviation of the bank's return on assets and the bank's return on equity are computed by three-month rolling window. Greater *ZROA* and *ZROE* are related with a higher bank's level of soundness. A lower number, on the other hand, indicates that the bank is more vulnerable to insolvency threats.

In terms of explanatory variables of interest, COVID-19 is used as an independent variable. Similar to the existing literature, the COVID-19 measure relates to the monthly growth in cases confirmed by COVID-19. The measurement of this indicator is also used by previous studies, although the period of the outbreak in each country varies depending on when the first COVID-19 case was confirmed (Anh & Gan, 2020; Ashraf, 2020; and Al-Awadhi et al., 2020). This study also examines several bank-specific controls (bank concentration, the non-interest income to total assets, bank size, the proportion of total third-party funds held by banks to total assets, the loan-to-value ratio of total assets, the ratio of operating expenses divided by operating income and macroeconomic variables (the Bond Yield and exchange rate volatility).

Regressions are in two stages in econometric methodology. In the first phase, the COVID-19 equation was measured at the same time by monthly growth in confirmed cases and a number of control variables as in the equation 1 is regressed. The previous stage is repeated in the second stage, though the sample is broken down between large and small banks and government-owned and private banks. The following model is used to predict bank stability:

$$\begin{aligned} BS_{i,t} &= \beta_0 + \beta_1 COVID19_t + \beta_2 HHI_{i,t} + \\ &+ \beta_3 SIZE_{i,t} + \beta_4 DEPO_{i,t} + \beta_5 LTA_{i,t} + \\ &+ \beta_6 NII_{i,t} + \beta_7 OEOI_{i,t} + \beta_8 OBL_{i,t} + \\ &+ \beta_9 EXG_{i,t} + \varepsilon_{i,t}, \end{aligned} \quad (3)$$

where $i$ denotes an individual bank, $t$ refers to a month, and bank stability (BS) represents the dependent variable. The COVID-19 pandemic represents the independent variable. Similarly, *HHI*, *SIZE*, *DEPO*, *LTA*, *NII*, *OEOI*, *OBL*, and *EXG* represent industry-specific and bank-specific control variables. Also, $\varepsilon_{i,t}$ is the error terms at the bank level. Following Ashraf (2020), Al-Awadhi et al. (2020), and Anh and Gan (2020), the panel-data regression methodology is used in this work. Panel data analysis derives time-series and cross-sectional variation from the fundamental panel data while minimizing heteroscedasticity, multicollinearity, and estimate bias (Baltagi, 2008; Woolridge, 2010). The least square approach of fixed effects model (FEM) was utilized, similar to Al-Awadhi et al. (2020). The Hausman test examined the possibility of using fixed effects as opposed to random effects regression model. Using panel data, the model for a fixed effect generates unbiased and consistent coefficient estimates (Wooldridge, 2010). As a robustness check, the regression models were performed using ordinary least squares (OLS) and random effects model (REM).

## 3. RESULTS

Between March 2020 and March 2021, Table 1 summarizes the average and standard deviation of all variables. Greater *ZROA* and *ZROE* are associated with a higher level of bank safety. Conversely, a lower number indicates that a bank is more susceptible to insolvency threats. Overall, the adverse effects of the pandemic appear to have a severe impact on the financial stability of the banking sector. Indeed, the stability of the world's banks has diminished or is lower than it was before the pandemic. In Indonesia, the average *ZROA* and *ZROE* for the sample banks are 127.9 and 137.3, while the standard deviation is 340.7 and 461.9, respectively. Meanwhile, the monthly growth in COVID-19 confirmed cases (COVID19) mean is 96.07 percent, while the standard deviation is 123 percent.


http://dx.doi.org/10.21511/bbs.17(2).2022.11

**Table 1.** Descriptive statistics

| Variables | Definition | Obs. | Mean | Std. dev |
|---|---|---|---|---|
| *ZROA* | Z-score = (***ROA*** + ***EQTA***)/***SDROA***; ***ROA*** represents return/assets; ***EQTA*** is total equity/ total assets, SDROA is the Std. dev of ***ROA*** | 1,278 | 127.9 | 340.7 |
| *ZROE* | Z-score = (***ROE*** + ***EQTA***)/***SDROE***; ***ROE*** represents return/equity; ***EQTA*** is total equity/ total assets, ***SDROE*** is the Std. dev of ***ROE*** | 1,278 | 137.3 | 461.9 |
| *COVID19* | Growth in confirmed cases (%) | 1,170 | 96.07 | 121.0 |
| *HHI* | Herfindahl-Hirschman index of banks' assets | 1,170 | 73.59 | 101.5 |
| *SIZE* | The logarithm of total assets bank | 1,278 | 689.4 | 18.35 |
| *DEPO* | The ratio of total third-party funds held by banks to total assets (%) | 1,278 | 17.00 | 1.433 |
| *LTA* | Loan-to-assets ratio (%) | 1,278 | 68.58 | 16.00 |
| *NII* | Non-interest income to total assets (%) | 1,278 | 55.19 | 16.05 |
| *OEOI* | The ratio of operating expenses to operating income (%) | 1,278 | 1.716 | 9.261 |
| *OBL* | Indonesia 3-Year Bond Yield (%) | 1,278 | 89.12 | 32.86 |
| *EXG* | Indonesian Rupiah to USD exchange rate | 1,278 | 5.631 | 0.702 |

**Table 2.** Correlation matrix

| Variables | COVID19 | HHI | SIZE | DEPO | LTA | NII | OEOI | OBL | EXG |
|---|---|---|---|---|---|---|---|---|---|
| *COVID19* | 1.0000 | – | – | – | – | – | – | – | – |
| *HHI* | –0.6118 | 1.0000 | – | – | – | – | – | – | – |
| *SIZE* | –0.0128 | 0.0080 | 1.0000 | – | – | – | – | – | – |
| *DEPO* | –0.0092 | –0.0012 | 0.1181 | 1.0000 | – | – | – | – | – |
| *LTA* | 0.0844 | –0.0703 | 0.0665 | 0.1342 | 1.0000 | – | – | – | – |
| *NII* | 0.0798 | –0.0703 | 0.0054 | –0.2160 | –0.0905 | 1.0000 | – | – | – |
| *OEOI* | 0.0292 | –0.0344 | –0.2667 | –0.0706 | –0.0364 | 0.0019 | 1.0000 | – | – |
| *OBL* | 0.7817 | –0.5124 | –0.0187 | –0.0145 | 0.1089 | 0.1134 | 0.0313 | 1.0000 | – |
| *EXG* | 0.5258 | –0.3514 | –0.0085 | 0.0201 | 0.0744 | 0.0377 | –0.0088 | 0.4363 | 1.0000 |

This shows the high number of confirmed cases in Indonesia, making Indonesia the country with the highest confirmed cases of COVID-19 in the Asia Pacific.

The corresponding structure of the variables is shown in Table 2. The high correlation between independent variables exceeding 0.80 is suggestive of multicollinearity issues. However, Table 2 demonstrates that there is no correlation and that the coefficient value is less than 0.80. This indicates that there is no problem with multicollinearity.

The regression analysis proceeds as follows. First, the association between the COVID-19 pandemic and bank stability is examined. The first stage is repeated in a second step, though the sample is also broken down between large and small banks and government-owned and private banks. Months fixed effects are also controlled by using months' dummies. In the next step, the robustness of the main results is checked in three ways.

Table 3 shows the baseline regression results focusing on the relationship between the epidemic of COVID-19 and bank stability. The pandemic is measured using monthly growth in the amount of confirmed cases (*COVID19*). From all regression, this result indicates that COVID-19 has disrupted bank stability, which can be seen from the negative coefficient. In column 2, the coefficient on COVID-19 is negative (–0.251 and –0.150) and significant (at 0.01) for bank stability (*ZROA*), while in columns 3-4, the coefficient on COVID–19 is also negative (–0.326 and –0.209) and significant (at 0.01 and 0.05) for bank stability (*ZROE*). Overall, in columns 1-4, the coefficient of COVID-19 is negative and significant, thus supporting *H1*. These findings are consistent with Elnahass et al. (2021) and Ozsoy et al. (2020) who showed the negative impact of the COVID-19 pandemic on bank stability.

Bank concentration (*HHI*) is a control variable that has a detrimental impact on bank stability. Thus, the competition-fragility hypothesis is supported by this outcome. The exchange rate shows positive results, which means that the increase in the exchange rate encourages bank stability. Meanwhile, deposit to loan also has a substantial negative effect (*DEPO*).

**Table 3.** COVID-19 and bank stability – baseline regression

| Explanatory variables | Dependent variables | | | |
|---|---|---|---|---|
| | ZROA | | ZROE | |
| | (1) | (2) | (3) | (4) |
| *COVID19* | –0.251*** | –0.150*** | –0.326*** | –0.209** |
| | (–4.37) | (–3.76) | (–4.18) | (–3.18) |
| *HHI* | –2.282*** | –2.952*** | –2.802*** | –3.653*** |
| | (–3.93) | (–3.68) | (–4.18) | (–3.91) |
| *SIZE* | –46.06 | –46.71 | –111.4 | –128.6 |
| | (–0.69) | (–0.74) | (–0.78) | (–0.85) |
| *DEPO* | –4.774* | –4.914* | –2.057 | –2.192 |
| | (–2.54) | (–2.60) | (–0.58) | (–0.62) |
| *LTA* | 1.679 | 0.889 | –3.401 | –3.486 |
| | (0.81) | (0.40) | (–0.57) | (–0.65) |
| *NII* | –0.256 | –0.473 | 0.658 | 0.363 |
| | (–0.87) | (–1.25) | (0.57) | (0.36) |
| *OEOI* | –0.0115 | –0.0679 | 0.149 | 0.0552 |
| | (–0.07) | (–0.33) | (0.81) | (0.25) |
| *OBL* | –13.99 | –67.08 | –2.626 | –76.60* |
| | (–0.72) | (–1.79) | (–0.10) | (–2.02) |
| *EXG* | 0.133*** | 0.121** | 0.148*** | 0.161** |
| | (3.45) | (3.27) | (3.76) | (3.24) |
| Constant | 904.6 | 1922.9 | 2188.7 | 3335.4 |
| | (0.82) | (1.70) | (0.85) | (1.29) |
| Time effect | No | Yes | No | Yes |
| R-Square | 0.0450 | 0.0661 | 0.0188 | 0.0340 |
| N bank | 108 | 108 | 108 | 108 |
| N obs. | 1170 | 1170 | 1170 | 1170 |

*Notes:* *** sig. at 1%, ** 5%, and * sig. at 10%. In parentheses, robust z-statistics are given.

**Table 4.** COVID-19 and bank stability – large vs small banks

| Explanatory variables | Dependent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ZROA | | | | ZROE | | | |
| | Large banks | | Small banks | | Large banks | | Small banks | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| *COVID19* | –0.129*** | –0.119** | –0.292*** | –0.164** | –0.161*** | –0.127** | –0.343*** | –0.185** |
| | (–3.69) | (–3.40) | (–3.45) | (–2.90) | (–4.36) | (–3.44) | (–3.54) | (–2.92) |
| *HHI* | –1.070*** | –1.669*** | –2.743** | –3.524** | –1.356*** | –2.014*** | –3.154*** | –3.994** |
| | (–5.07) | (–4.64) | (–3.30) | (–3.09) | (–5.89) | (–5.24) | (–3.50) | (–3.30) |
| *SIZE* | –39.29 | –29.44 | –151.2 | –128.2 | –12.89 | –1.442 | –445.1 | –502.2 |
| | (–1.47) | (–0.99) | (–0.97) | (–0.73) | (–0.44) | (–0.04) | (–1.50) | (–1.39) |
| *DEPO* | 0.177 | –0.276 | –6.281** | –6.408** | –0.195 | –0.77 | –3.728 | –3.978 |
| | (0.10) | (–0.15) | (–2.81) | (–2.82) | (–0.10) | (–0.39) | (–1.08) | (–1.21) |
| *LTA* | 2.48 | –1.789 | 1.262 | 1.262 | 4.016* | –1.062 | –7.161 | –6.326 |
| | (1.64) | (–0.74) | (0.45) | (0.43) | (2.25) | (–0.40) | (–0.86) | (–0.84) |
| *NII* | –1.852 | –3.085** | –0.0752 | –0.264 | –1.647 | –3.123* | 1.036 | 0.799 |
| | (–1.97) | (–3.06) | (–0.31) | (–1.05) | (–1.35) | (–2.51) | (0.68) | (0.57) |
| *OEOI* | –0.0502 | –0.117 | 0.0157 | –0.0342 | 0.00175 | –0.0768 | 0.0848 | –0.0727 |
| | (–0.22) | (–0.47) | –0.08 | (–0.12) | (0.01) | (–0.29) | (0.47) | (–0.31) |
| *OBL* | 5.694 | –8.931 | –23.31 | –90.92 | –4.532 | –24.47 | –13.93 | –107.6 |
| | (0.79) | (–0.82) | (–0.84) | (–1.69) | (–0.46) | (–1.77) | (–0.44) | (–1.95) |
| *EXG* | 0.0479*** | 0.0659** | 0.170** | 0.150** | 0.0615*** | 0.0747*** | 0.171** | 0.178** |
| | (4.12) | (3.52) | (3.04) | (2.82) | (5.01) | (3.98) | (2.99) | (2.92) |
| Constant | 685.4 | 1008.0* | 2594.1 | 3450.9 | 207.7 | 691.9 | 7868.7 | 9817.9 |
| | (1.90) | (2.24) | (1.00) | (1.13) | (0.54) | (1.41) | (1.50) | (1.61) |
| Time effect | No | Yes | No | Yes | No | Yes | No | Yes |
| R-Square | 0.1345 | 0.2765 | 0.0512 | 0.0734 | 0.1491 | 0.2996 | 0.0230 | 0.0419 |
| N bank | 34 | 34 | 74 | 74 | 34 | 34 | 74 | 74 |
| N Obs. | 367 | 367 | 803 | 803 | 367 | 367 | 803 | 803 |

*Notes:* *** sig. at 1%, ** 5%, and * sig. at 10%. In parentheses, robust z-statistics are given.


http://dx.doi.org/10.21511/bbs.17(2).2022.11

The sample is split into large and small banks and government-owned and private banks in the next stage. According to Table 4, there is a negative and significant impact of the COVID-19 pandemic on bank stability for all banks. There is a negative significant impression of the COVID-19 pandemic on all bank stability, rejecting *H2*. In columns 1-4 with *ZROA* as dependent variables, the coefficient of COVID-19 is negative (–0.129, –0.119, –0.292, and –0.164) and significant (at 0.01 and 0.05). The same result is also shown in columns 5-8 with *ZROE* as dependent variables that this study documents a negative coefficient (–0.161, –0.127, –0.343, and –0.185) and significant (at 0.01 and 0.05) of COVID-19.

Table 5 shows empirical results on whether the effects of the COVID-19 pandemic on bank stability are different in government-owned and private banks. In columns 1-4 with *ZROA* as dependent variables, this study finds a negative significant coefficient (–0.147, –0.098, –0.316, and –0.229), while columns 5-8 also display the same result, but with *ZROE* as the dependent variable, this study discovers a statistically significant negative coefficient (–0.179, –0.112, –0.443, and –0.335).

The pandemic has a great reduction impact on bank stability, which implies that a high number of confirmed cases lowers bank stability for all banks. These results indicate that the growth of COVID-19 cases reduces the stability of all banks, both state-owned and private, thus the findings of this study do not show that there is a different impact between the two types of banks, rejecting *H3*.

To ensure accurate and steady results, several additional tests were conducted. Following Chen et al. (2015) and Khan et al. (2017), the dependent variable was first replaced by alternative bank stability measures frequently used in the related literature. This study uses an alternative measure of bank stability is the loan loss provision or LLP (loan loss provision/total credit). The estimated results are summarized in Table 6. The findings indicate that the pandemic has a substantially detrimental effect on bank stability.

**Table 5.** COVID-19 and bank stability – government vs private banks

| Explanatory variables | Dependent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ZROA | | | | ZROE | | | |
| | Government banks | | Private banks | | Government banks | | Private banks | |
| | (1) | (1) | (1) | (2) | (3) | (4) | (4) | (4) |
| *COVID19* | –0.147** | –0.098** | –0.316*** | –0.229** | –0.179*** | –0.112** | –0.443** | –0.335** |
| | (–3.31) | (–2.73) | (–3.65) | (–3.18) | (–3.92) | (–2.96) | (–3.17) | (–2.65) |
| *HHI* | –1.110*** | –1.408*** | –2.944** | –4.121** | –1.335*** | –1.678*** | –3.789*** | –5.304** |
| | (–3.70) | (–3.61) | (–3.38) | (–3.20) | (–4.39) | (–4.23) | (–3.45) | (–3.32) |
| *SIZE* | 343.7 | 510.9 | –57.78 | –49.86 | 350.8 | 536.4 | –120.0 | –119.9 |
| | (1.32) | (1.64) | (–0.76) | (–0.71) | (1.36) | (1.75) | (–0.86) | (–0.89) |
| *DEPO* | –4.286 | –4.524 | –4.394 | –4.265 | –5.025 | –5.306 | 0.0144 | 0.108 |
| | (–1.51) | (–1.50) | (–1.95) | (–1.84) | (–1.88) | (–1.86) | (0.00) | (0.02) |
| *LTA* | 5.746 | 8.429 | 0.602 | –1.749 | 6.108 | 9.34 | –6.495 | –8.64 |
| | (1.44) | (1.74) | (0.21) | (–0.53) | (1.50) | (1.90) | (–0.81) | (–1.10) |
| *NII* | 4.050 | –1.336 | –0.203 | –0.467 | 5.105 | –1.939 | 0.761 | 0.383 |
| | (1.34) | (–0.28) | (–0.54) | (–1.06) | (1.45) | (–0.39) | (0.61) | (0.37) |
| *OEOI* | 0.0737 | 0.0191 | –0.0654 | –0.139 | 0.0888* | 0.0182 | 0.0892 | –0.0487 |
| | (1.92) | (0.50) | (–0.26) | (–0.42) | (2.14) | (0.42) | (0.41) | (–0.17) |
| *OBL* | 16.72 | –2.779 | –18.26 | –85.99 | 14.57 | –10.85 | 0.75 | –98.46 |
| | (1.73) | (–0.19) | (–0.64) | (–1.58) | (1.42) | (–0.69) | (0.02) | (–1.78) |
| *EXG* | 0.0725** | 0.0686** | 0.169** | 0.177** | 0.0880*** | 0.0808*** | 0.204** | 0.256** |
| | (3.18) | (3.41) | (2.85) | (2.80) | (3.80) | (4.12) | (3.13) | (2.66) |
| Constant | –6260.6 | –8919.5 | 1120.0 | 2206.2 | –6392.3 | –9285.2 | 2254.1 | 3242.1 |
| | (–1.32) | (–1.58) | (0.89) | (1.80) | (–1.36) | (–1.67) | (0.92) | (1.48) |
| Time effect | No | Yes | No | Yes | No | Yes | No | Yes |
| R-Square | 0.1591 | 0.2212 | 0.3012 | 0.0722 | 0.1852 | 0.2629 | 0.0215 | 0.0427 |
| N bank | 36 | 36 | 72 | 72 | 36 | 36 | 72 | 72 |
| N obs. | 393 | 393 | 777 | 777 | 393 | 393 | 777 | 777 |

*Note:* *** sig. at 1%, ** 5%, and * sig. at 10%. In parentheses, robust z-statistics are given.

Second, the power of the COVID-19 pandemic on bank performance was re-estimated using alternative measures shown in Table 7. Following Ashraf (2020) and Al-Awadhi et al. (2020), the monthly growth in COVID-19 death cases (gDEATH) was used as the independent variable. As expected, these robustness tests' results further validate the key findings that there is a negative connection between the monthly progress in COVID-19 death cases (gDEATH) and bank stability.

An alternative estimator reported in Table 8 was also used. Following Demirguc-Kunt et al. (2020) and Al-Awadhi et al. (2020), the Random Effects Model (REM) and Ordinary Least Square (OLS) were used to check the validity of the results further. The COVID-19 pandemic has a negative and statistically significant coefficient in all models in line with general expectations. This means that the COVID-19 pandemic disturbs bank stability. Overall, this study shows that the COVID-19 pandemic negatively and significantly affects bank stability.

**Table 6.** COVID-19 and bank stability – robustness checks with alternative measurement of bank stability

| Explanatory variables | Dependent variable: LLP | |
|---|---|---|
| | (1) | (2) |
| COVID19 | 0.0000192** | 0.0000343** |
| | (2.05) | (2.52) |
| HHI | 0.000176* | 0.000285* |
| | (2.36) | (2.44) |
| SIZE | −0.216** | −0.218** |
| | (−2.92) | (−2.96) |
| DEPO | −0.00108 | −0.00111 |
| | (−1.77) | (−1.79) |
| LTA | −0.00222* | −0.00201* |
| | (−2.51) | (−2.34) |
| NII | 0.000146 | 0.000167 |
| | (1.16) | (1.22) |
| OEOI | 0.0000165 | 0.0000114 |
| | (0.38) | (0.26) |
| OBL | −0.00383 | −0.00254 |
| | (−1.91) | (−1.10) |
| EXG | −5.26E−07 | −0.0000122* |
| | (−0.20) | (−2.06) |
| Constant | 3.837** | 3.943** |
| | (2.92) | (3.02) |
| Time Effect | No | Yes |
| R-Square | 0.6469 | 0.6535 |
| N Bank | 95 | 95 |
| N Obs. | 1122 | 1122 |

*Note:* *** sig. at 1%, ** 5%, and * sig. at 10%. In parentheses, robust z-statistics are given. LLP = Loan Loss Provision to Total Loan (%).

**Table 7.** COVID-19 and bank stability – robustness checks with alternative measurement of COVID-19

| Explanatory variables | Dependent variables | | | |
|---|---|---|---|---|
| | ZROA | | ZROE | |
| | (1) | (2) | (3) | (4) |
| GDEATH | −0.216*** | −0.147*** | −0.297*** | −0.204** |
| | (−4.47) | (−3.76) | (−3.73) | (−3.18) |
| HHI | −2.131*** | −2.875*** | −2.634*** | −3.546*** |
| | (−3.87) | (−3.65) | (−4.10) | (−3.91) |
| SIZE | −47.05 | −46.71 | −112.3 | −128.6 |
| | (−0.70) | (−0.74) | (−0.79) | (−0.85) |
| DEPO | −4.744* | −4.914* | −2.023 | −2.192 |
| | (−2.53) | (−2.60) | (−0.57) | (−0.62) |
| LTA | 1.726 | 0.889 | −3.356 | −3.486 |
| | (0.83) | (0.40) | (−0.56) | (−0.65) |
| NII | −0.246 | −0.473 | 0.668 | 0.363 |
| | (−0.83) | (−1.25) | (0.58) | (0.36) |
| OEOI | −0.015 | −0.0679 | 0.145 | 0.0552 |
| | (−0.10) | (−0.33) | (0.78) | (0.25) |
| OBL | −22.7 | −70.92 | −12.36 | −81.95* |
| | (−1.10) | (−1.88) | (−0.47) | (−2.14) |
| EXG | 0.126** | 0.116** | 0.139*** | 0.155** |
| | (3.38) | (3.22) | (3.67) | (3.23) |
| Constant | 964.8 | 1951 | 2259.8 | 3375.8 |
| | (0.86) | (1.72) | (0.88) | (1.30) |
| Time effect | No | Yes | No | Yes |
| R-Square | 0.0435 | 0.0661 | 0.0182 | 0.0340 |
| N bank | 108 | 108 | 108 | 108 |
| N obs. | 1170 | 1170 | 1170 | 1170 |

*Note:* *** sig. at 1%, ** 5%, and * sig. at 10%. In parentheses, robust z-statistics are given.

# 4. DISCUSSION

This research presents the baseline regression findings regarding the relationship between the COVID-19 pandemic and bank stability. The pandemic is defined by a monthly increase in the number of confirmed cases (COVID-19). All regressions indicate that the COVID-19 pandemic has a substantial detrimental effect on bank stability. This is due to the fact that COVID-19 has a negative impact on bank stability. The results reveal a statistically significant decline in bank stability through the COVID-19 pandemic period.

The results are in line with closely related works that analyzed the COVID-19 pandemic's effect on bank risk. Li et al. (2020) developed a model that shows banks are more prone to risky lending, which has a detrimental effect on their stability during a pandemic. With different measurements,


http://dx.doi.org/10.21511/bbs.17(2).2022.11

**Table 8.** COVID-19 and bank stability – robustness checks with alternative measurement of econometric specifications

| Explanatory variables | Dependent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ZROA | | | | ZROE | | | |
| | OLS | | Random effect | | OLS | | Random effect | |
| | (1) | (1) | (1) | (2) | (3) | (4) | (4) | (4) |
| *COVID19* | −0.259* | −0.474* | −0.256*** | −0.550* | −0.326* | −0.53* | −0.325*** | −0.541* |
| | (−1.89) | (−1.73) | (−4.39) | (−2.31) | (−2.31) | (−1.89) | (−4.49) | (−2.32) |
| *HHI* | −2.344** | −3.134** | −2.336*** | −3.316** | −2.763*** | −3.584** | −2.777*** | −3.632*** |
| | (−3.21) | (−2.75) | (−3.94) | (−3.03) | (−3.59) | (−3.08) | (−4.42) | (−3.35) |
| *SIZE* | −11.11* | −11.13* | −11.59 | −11.32 | −7.318 | −7.647 | −7.991 | −8.723 |
| | (−2.18) | (−2.18) | (−0.95) | (−0.91) | (−1.38) | (−1.44) | (−0.71) | (−0.76) |
| *DEPO* | 0.793 | 0.746 | −1.588 | −1.717 | 1.040 | 0.985 | 0.494 | 0.4001 |
| | (1.28) | (1.21) | (−1.23) | (−1.31) | (0.65) | (0.62) | (0.31) | (0.25) |
| *LTA* | −1.759* | −1.836** | −0.358 | −0.76 | −2.398** | −2.407* | −2.463 | −2.474 |
| | (−2.56) | (−2.67) | (−0.26) | (−0.52) | (−2.71) | (−2.58) | (−1.40) | (−1.46) |
| *NII* | −1.027** | −1.254*** | −0.332 | −0.585 | −0.0798 | −0.329 | 0.339 | 0.0494 |
| | (−3.00) | (−3.68) | (−1.28) | (−1.60) | (−0.14) | (−0.60) | (0.38) | (0.06) |
| *OEOI* | 0.184 | 0.159 | −0.0252 | −0.0695 | 0.237 | 0.193 | 0.182 | 0.118 |
| | (1.07) | (0.91) | (−0.18) | (−0.41) | (0.46) | (0.39) | (0.73) | (0.43) |
| *OBL* | −2.445 | −283.6** | −7.41 | −275.2** | 1.083 | −330.8*** | −0.0786 | −329.7*** |
| | (−0.10) | (−3.07) | (−0.37) | (−3.21) | (0.04) | (−3.51) | (−0.00) | (−3.68) |
| *EXG* | 0.130** | 0.858** | 0.131*** | 0.866** | 0.141** | 0.981*** | 0.142*** | 0.981*** |
| | (2.84) | (3.10) | (3.42) | (3.23) | (2.71) | (3.47) | (3.68) | (3.62) |
| Constant | 131.2 | −8139.5** | 243.3 | −8028.5** | 201.9 | −9352.0*** | 259.2 | −9264*** |
| | (0.14) | (−3.07) | (1.16) | (−3.24) | (0.21) | (−3.47) | (1.08) | (−3.67) |
| Time effect | No | Yes | No | Yes | No | Yes | No | Yes |
| R-Square | 0.0287 | 0.0402 | 0.0398 | 0.0613 | 0.0198 | 0.0309 | 0.0169 | 0.0318 |
| N bank | 108 | 108 | 108 | 108 | 108 | 108 | 108 | 108 |
| N Obs | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 |

*Note:* *** sig. at 1%, ** 5%, and * sig. at 10%. In parentheses, robust z-statistics are given.

Rizwan et al. (2020) obtain similar findings. They showed that the COVID-19 pandemic sharply increases systemic risk in the banking sector's financial systems. Wu and Alson (2020) reported a negative association between COVID-19 and asset quality of banks in the short term and the greater pressure on credit risks in the long term.

Among control variables, bank concentration (HHI) is negatively significant on bank stability, which is consistent with Uhde and Heimeshoff (2009), Beck et al. (2013), and Berger et al. (2009). There is also a negative and significant effect of deposit to loan (DEPO), which is not similar with Wagner (2007). Moreover, the exchange rate (EXG) has a detrimental and significant impact on bank stability. This shows, in line with Faia et al. (2019), Juhro and Phan (2018), and Eichengreen (1998), that exchange rate volatility may result in market uncertainty, fluctuations in trade earnings, hazards to growth, inflation unpredictability, an unfavorable trade balance, and increased production costs and operation expenses.

In the next stage, the sample is divided into major and small banks, as well as government-owned and private banks. The impact of the epidemic on bank stability is unaffected by the level of core capital, according to this study. The COVID-19 pandemic has had a detrimental effect on bank stability, not just on small banks, but also on large banks. The COVID-19 cases have had a substantial influence on all banks' stability. This is inconsistent with earlier research demonstrating the benefit of large banks (*too big to fail*) during the global financial crisis, which resulted in infectious financial and economic distress. For instance, Varmaz et al. (2015) established that conjectural *"too big to fail"* guarantees prevent large banks' negative effects in distressing financial circumstances resulting from the global financial crisis. Therefore, in a health crisis situation such as the COVID-19 pandemic, the bank's core capital size does not work.

The results of this analysis reveal whether the impact of the COVID-19 epidemic on bank

stability varies between government and private banks. The pandemic has had a significant negative influence on bank stability, indicating that a large number of confirmed cases has weakened bank stability, not only for state banks but also for private banks. Thus, these results provide empirical evidence that those state and private banks are similarly impacted by COVID-19. Indeed, the impact of the pandemic has disrupted the economic conditions of all countries. However, the government is expected to play a role in resolving this health crisis by implementing countercyclical policies. Therefore, these results indicate that state banks failed in controlling the severe loss in bank stability amid economic stress caused by COVID-19.

Overall, these findings provide empirical evidence that the epidemic has harmed Indonesia's banking system. There is not a single bank that has not seen a significant reduction in stability as the number of COVID-19 cases increases. In other words, regardless the amount and ownership of a bank's core capital, no bank is immune to the harmful effects of the COVID-19 epidemic for one year. This result also confirms how devastating the health crisis caused by COVID-19 is to the stability of the financial system compared to the global financial crisis.

## CONCLUSION

This study assesses the impact of the coronavirus case on bank stability by separating bank core capital size and ownership. According to the findings of this study, the COVID-19 pandemic has a negative and statistically significant influence on bank stability, not just for state banks but also for private banks, large and small banks. Furthermore, there are strong findings regarding the negative impact of the COVID-19 epidemic on bank stability. These findings show that the epidemic has harmed Indonesia's banking system. There has been no bank that has not seen a significant decrease in stability as the number of COVID-19 cases increases.

This study provides various policy implications to mitigate bank stability. First, this study sheds new light on the preponderance of too big to fail effects that are not relevant during health crises, thus the policy intervention adopted during the pandemic in the form of stimulus packages is not based on the bank's core capital size. Second, governance plays a more active countercyclical role in the banking system through government-owned banks. Future research needs to focus on the causal connection between bank stability and policy for COVID-19 responses such as stimulus packages.

## AUTHOR CONTRIBUTIONS

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http://dx.doi.org/10.21511/bbs.17(2).2022.11

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