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-RESEARCH ARTICLE-

BANK EFFICIENCY BEFORE, DURING, AND AFTER COVID-19: A LESSON LEARNED FROM INDONESIA

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—Abstract—

The COVID-19 pandemic has had a significant impact on the global banking industry, primarily because there has been an increase in non-performing loans, which has reduced bank profitability. Responding to this challenge, the Financial Services Authority has put in place a series of stimulus measures aimed at maintaining operational efficiency within the banking sector. It is crucial to thoroughly analyse the effects of the stimulus measures implemented by the Financial Services Authority (OJK) on the banking sector. This study seeks to assess the technical efficiency of banking in Indonesia prior to, during, and post the COVID-19 pandemic (2018-2022). In addition, the research highlights the countercyclical policies implemented by the Indonesian Banking Authority in reaction to the risks brought about by COVID-19. The study sample comprises data from 106 Commercial Banks (Conventional Banks), 13 Sharia Banks, 20 Sharia Business Units, and 167 Sharia Rural Banks. During the pandemic period in 2020, the Data Envelopment Analysis revealed that Commercial Banks, Sharia Business Units, and Sharia Rural Banks collectively faced inefficiency. Collectively, Sharia Banks were not operating efficiently both before and during the pandemic. In 2022, following the conclusion of the COVID-19 pandemic, all banks reached optimal efficiency levels. This study highlights the beneficial effects of implementing countercyclical policies by the Indonesian Financial Services Authority on the banking sector's resilience amid the COVID-19 pandemic. Based on the results, this study suggests that banking authorities in each country should adopt countercyclical policies in response to different crisis triggers.

Keywords: Data Envelopment Analysis, COVID-19, Conventional Bank, Sharia Bank, Sharia Business Unit, Sharia Rural Bank.

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INTRODUCTION

According to the study conducted by Yan, Jeon, & Wu (2023), the COVID-19 pandemic presents substantial systemic risks on a global scale, particularly affecting advanced economies more than developing countries. Bigger banks with elevated loan-to-deposit ratios experienced greater impact from the COVID-19 pandemic, despite having higher bank capitalization which was not enough to protect them from the negative consequences of the pandemic (Yan, Jeon, & Wu, 2023). An investigation carried out by (Xiazi & Shabir, 2022) analysed the effects of the COVID-19 outbreak on the banking sector's performance in 85 countries, uncovering a notable decrease in the performance of these banks. In addition, smaller banks with lower capital and less diversification were especially affected by the negative effects of COVID-19 on bank performance (EL-Chaarani et al., 2023). In recent research conducted by Mateev, Usman Tariq, & Sahyouni (2023), they analysed 225 banks across 18 countries in the Middle East and North Africa region from 2006 to 2020. The study found that the impact of market concentration was stronger in Islamic banks compared to conventional banks amid the COVID-19 pandemic.

The primary concern arising from the COVID-19 pandemic is the rise in Non-Performing Loans, attributed to bank debtors facing challenges in meeting their financial obligations (Shen et al., 2021). During the height of the COVID-19 pandemic, governments worldwide enforced restrictions on social activities, with some halting them entirely or imposing lockdowns (Xiazi & Shabir, 2022). This lockdown led to a significant decrease in economic activity (Khlystova, Kalyuzhnova, & Belitski, 2022).

To address the potential decrease in performance caused by a rise in Non-Performing Loans, banks must enhance efficiency by reorganising the credit of debtors impacted by COVID-19. According to a recent study by Nguyen, Nguyen, & Tram Tran (2022), the revision of credit terms will reduce the impact of Provision for Credit Impairment Losses. The goal is to reduce the decrease in bank profits. Evidence indicates that banks are not solely responsible for reducing reserves for credit impairment losses. Banking regulators also aim to maintain banking stability by relaxing regulations to help ease the burden of reserves for impairment losses (Polyzos, Samitas, & Kampouris, 2021). Credit impacted by the COVID-19 pandemic.

In Indonesia, banks and regulators seem to have successfully navigated the challenges posed by the COVID-19 pandemic. This achievement was facilitated by the efficient support from banks and the stimulus provided by the Financial Services Authority (Naiborhu & Ulfa, 2023). Figure 1 below illustrates the Total Lending, Total Funding, and Total Assets of banks in Indonesia that have been steadily increasing from June 2018 to December 2022. Between June 2018 and December 2022, the Total Funding rose from 6,278,008 to 9,077,079. Similarly, the amount of loans increased from IDR 7,549,819 to IDR 11,241,371. The surge in funding led to an increase in lending, resulting in a rise in the assets of banks in Indonesia from IDR 7,778,548 to IDR 11,295,623.

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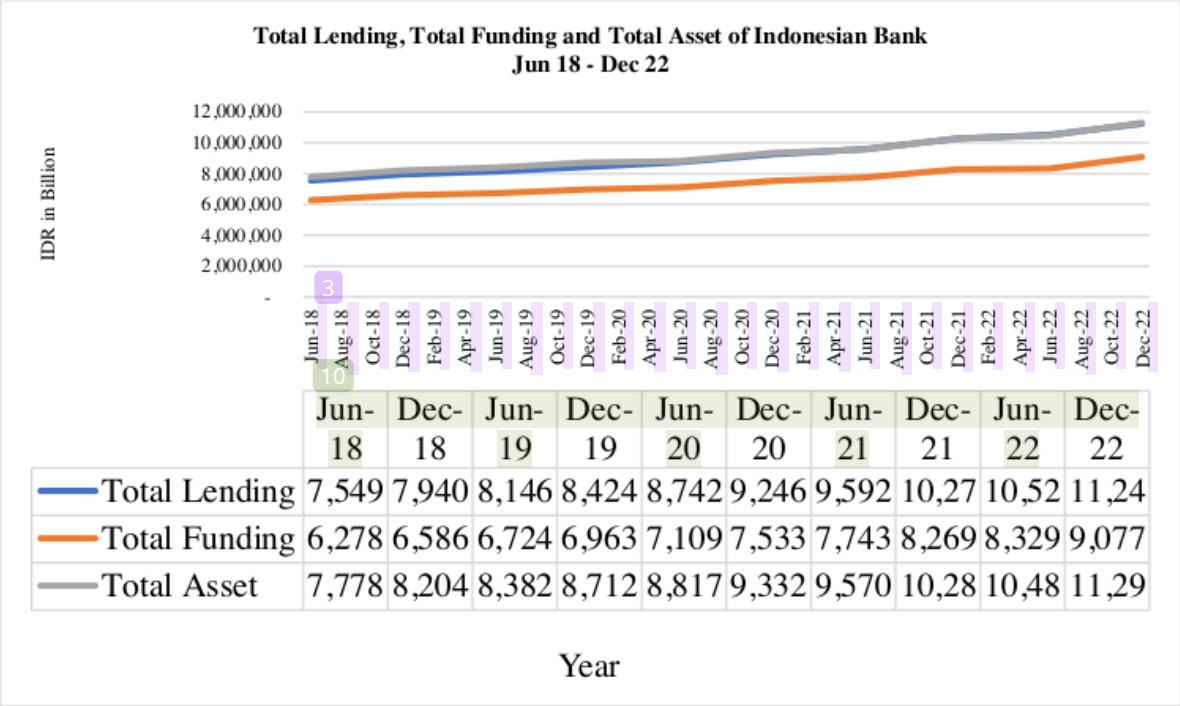

	Jun-18	Dec-18	Jun-19	Dec-19	Jun-20	Dec-20	Jun-21	Dec-21	Jun-22	Dec-22
Total Lending	7,549	7,940	8,146	8,424	8,742	9,246	9,592	10,27	10,52	11,24
Total Funding	6,278	6,586	6,724	6,963	7,109	7,533	7,743	8,269	8,329	9,077
Total Asset	7,778	8,204	8,382	8,712	8,817	9,332	9,570	10,28	10,48	11,29

Figure 1: Total Lending, Total Funding and Total Asset of Indonesian Bank Jun 18-Dec 22.
Source: Indonesian Banking Statistics 2018, 2019, 2020, 2021, 2022.

Research on the effects of the COVID-19 pandemic on the banking industry in Indonesia has attracted considerable interest. The research carried out by Maria, Yudaruddin, & Azizil Yudaruddin (2022) found that all banks were affected by the significant consequences of COVID-19, regardless of their ownership or size. Furthermore, there has been a shortage of additional research on the banking conditions following the pandemic recovery period. One important area to consider is the operational efficiency of banks prior to, during, and post the pandemic.

Banking serves as an intermediary institution that collects funds from the public and redirects them back to the public (Fernandes, Stasinakis, & Bardarova, 2018). Measuring the effectiveness of banking as an intermediary institution involves comparing input variables (funding and operational expenses) with output variables (credit or lending, asset, and operating income). Financial resources refer to the funds accumulated by the banking sector, comprising overall Savings, Deposits, and Current Accounts, whereas Operational Costs consist of total interest expenditures and general and administrative expenses. General and Administrative costs include labour expenses along with office and marketing expenses (Blankson et al., 2022).

As the bank amasses more funds, it enhances its capacity to lend them out as credit and generate revenue through interest income from borrowers utilising the funds (Blankson et al., 2022; Gržeta, Žiković, & Tomas Žiković, 2023). Upon receiving interest income,

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the bank can use it to pay interest expenses to depositors and cover labour and office expenses as operational income. The excess of operating income over operational expenses leads to net income, consequently boosting the bank's assets.

During the COVID-19 pandemic, the banking sector faces a major challenge due to the decrease in credit quality, resulting in a rise in non-performing loans. The increase in non-performing loans not only decreases interest income but also requires setting aside provisions for credit loss. Banking regulators are focused on maintaining the strength of the banking sector amid the challenges posed by the COVID-19 pandemic (Le et al., 2022; Polyzos, Samitas, & Kampouris, 2021). In Indonesia, banking regulators have implemented a series of deregulations to support the banking sector and help it navigate through challenges (Susilowati & Purnama, 2022). An important regulation from the Indonesian Banking Authority is Regulation Number 11/POJK.03/2020 on the National Economic Stimulus as a Countercyclical Policy in Response to the Spread of COVID-19, which was effective until March 31, 2021. This national economic stimulus was designed to mitigate the effects of COVID-19 by introducing measures to restructure credit and alleviate the financial strain on individuals, especially Small and Medium Enterprises (SMEs) facing credit challenges.

This research project seeks to examine the banking efficiency in Indonesia prior to, during, and post the COVID-19 pandemic. In addition, the study will reveal the effectiveness of different categories of banks, such as Conventional Banks, Islamic Banks, Sharia Business Units, and Sharia Rural Banks. Furthermore, the research will investigate the effects of countercyclical policies implemented by the Financial Services Authority on banking efficiency. This research can offer valuable insights into successful policy strategies and measures to strengthen the resilience of the banking sector.

LITERATURE REVIEW

Efficiency plays a vital role in evaluating an organization's performance. Efficiency revolves around an organization's capacity to produce the best results using the resources at hand. By separating the price and quantity of input-output units, it becomes possible to determine the levels of overall technical efficiency, allocative efficiency, and economic efficiency. The concept was initially introduced by Farrel (1959), who distinguished efficiency into two components: technical efficiency and allocative efficiency. Efficiency in operations shows how well an organisation can produce the most output with the resources available, and how effectively it can allocate resources at a given price. These two elements are brought together to calculate a measure of overall economic effectiveness.

Efficiency encompasses efficiency in the production, consumption, and allocation of resources. When it comes to relative efficiency, enhancing the economic standing of

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one entity will inevitably lead to a decrease in the economic position of the other entity. An entity is considered completely efficient when no improvements can be made to any of its inputs or outputs without impacting other inputs or outputs. Put simply, an entity is considered efficient when the output is maximised based on the inputs provided (Charnes, Cooper, & Rhodes, 1978). The relative efficiency methodology has its origins in the late 1970s with Sealey Jr & Lindley (1977). Banker, Charnes, & Cooper (1984) later expanded on this. In Sherman & Gold (1985) conducted an early analysis on bank branch efficiency using the DEA methodology. Valuable data was discovered regarding ineffective branches and opportunities for enhancing efficiency. Their research indicates that the DEA methodology is superior to other methods in evaluating bank branch efficiency. Following this, there has been a rise in using the DEA methodology to assess the relative efficiency of banks (Barth et al., 2013; Chortareas, Girardone, & Ventouri, 2012; Gržeta, Žiković, & Tomas Žiković, 2023; Pasiouras, 2008).

DEA was developed by Charnes, Cooper, & Rhodes (1978), building on Farrel's work in 1957. The Data Envelopment Analysis (DEA) is a method that uses linear programming models to determine the efficiency of Decision-Making Units (DMUs) by comparing their output-input ratios within a population. The DEA method can handle various input and output variables when assessing bank efficiency. The measurement is sensitive to the specific input-output variables, enabling management to pinpoint areas needing improvement to boost bank efficiency. DEA has been extensively utilised in the banking literature (Berger & Demirgüç-Kunt, 2021; Miller & Noulas, 1996; Weill, 2003).

According to Barth et al. (2013), DEA offers multiple advantages over parametric methods like stochastic frontier analysis (SFA) when assessing efficiency. The DEA method computes the input/output data of sample banks without being affected by functional form dependency. Parametric methods exhibit functional form dependency, requiring an assumption of a specific functional form and the imposition of a defined structure on the efficient frontier's shape. The results are contingent on the accuracy of the assumption. DEA offers an advantage by concentrating on individual units like banks or firms, rather than the population average, leading to more accurate predictions of individual efficiency. One benefit is that individual units are compared to the best-practice frontier instead of the central tendency properties.

The DEA method's main advantage lies in its non-parametric nature, but this also leads to a limitation as it cannot estimate model parameters and is heavily impacted by the choice and number of input variables. According to the DEA framework, a bank with an efficiency score of 1 (100%) is located on the efficient frontier, suggesting that it cannot increase its outputs without increasing its inputs (Řepková, 2015). Alternatively, a bank with an efficiency score below 100% is deemed relatively inefficient, suggesting that it can sustain its current output level with fewer inputs. Every bank or decision-

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making unit (DMU) function with a set number of inputs (i) and outputs (o), indicating that each DMU uses a distinct quantity of input to generate a particular output.

The objective of the Data Envelopment Analysis (DEA) technique is to assess the efficiency of a particular bank as a Decision-Making Unit (DMU) in relation to other banks in the sample. Efficiency scores for each bank are comparative and influenced by the efficiency levels of other banks in the sample. DEA Frontier Efficiency involves two scale measurement approaches: Constant Returns to Scale (CCR) and Variable Returns to Scale (VRS). CCR is a scale measurement method in DEA that assumes resources are used proportionally and constantly among the decision-making units being evaluated for efficiency. It is assumed that the production scale used by these units will remain constant in this case. Alternatively, VRS is a scale measurement in DEA that accounts for varying efficiency levels among decision-making units based on production scales. Within VRS, the units being evaluated have the flexibility to select different production scales, as it is considered a variable in their operations. Put simply, VRS enables these units to modify their operational size for optimal efficiency.

The formula for CCR can be written as (Bowlin, 1998):

$$max\ h_0\,(u,v) = \frac{\sum_{r=1}^{s} u_r\ y_{r0}}{\sum_{i=1}^{m} v_i\ x_{i0}}$$

$$subject\ to \frac{\sum_{r=1}^{s} u_r\ y_{rj}}{\sum_{i=1}^{m} v_i\ x_{ij}} \leq 1, \mathrm{j} = 1,2 \ldots j_0\ , \ldots, n,$$

$$u_r \geq 0, r = 1,2, \ldots, s$$

$$v_i \geq 0, i = 1,2, \ldots, m$$

where 'u' and 'v' denote the assigned weights for each input and output. The DEA assigns weights to ensure that no other DMU achieves higher efficiency. The objective function of the DMU is calculated as the ratio of the total weighted output to the total weighted input. Here, h0 represents the technical efficiency of DMUo to be estimated, while vi and ur are the weights to be optimised. Xij is the input amount of the ith type for the jth DMU, Yrj is the observed output amount of the rth type for the jth DMU. The variables i, r, and j represent different inputs, outputs, and DMUs respectively.

The formula for VCR can be written as (Bowlin, 1998):

$$minimize: \theta - \epsilon \left[\sum_{i=1}^{m} s_i \quad + \sum_{r=1}^{s} s_r^{+} \right]$$

$$subject\ to: \theta x_{i0} - \sum_{j=1}^{n} x_{ij}\ \lambda_{j-}\ s_i$$

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$$y_{r0} = \sum_{j=1}^{n} y_{rj}\,\lambda_{j-}\; s_r^+$$

$$1 = \sum \lambda_j$$

$$0 \leq \lambda_j, s_i^-, s_r^+ \quad for\ i = 1, \dots, m; \quad r = 1, \dots, s; \quad j = 1, \dots, n$$

The CCR and VCR models have a distinction where λ is constrained to sum up to one. This eliminates the requirement in the CCR model that DMUs need to be scale efficient. Therefore, the VCR model enables variable returns to scale and assesses solely technical efficiency for each DMU. Simply put, a DMU is deemed CCR efficient only if it demonstrates both scale and technical efficiency. For a Decision Making Unit (DMU) to be deemed BCC efficient, it must only achieve technical efficiency (Bowlin, 1998).

Prior studies have thoroughly investigated the measurement of banking sector efficiency. An investigation by Jemric & Vujcic (2002) examined bank efficiency in Croatia, revealing that factors such as bank size, ownership structure, years of establishment, and asset quality had an impact on efficiency levels. In a study by Staikouras, Mamatzakis, & Koutsomanoli-Filippaki (2008), cost efficiency in the banking sector across six Southeast European countries was emphasised, with variations in efficiency levels identified among these nations. In a study by Yudistra (2006), the efficiency of Islamic banks globally was assessed, showing that Islamic banks displayed moderate levels of inefficiency in comparison to conventional banks. In their study, Saaid, Rosly, & Abdullah (2003) employed the Stochastic Frontier Approach (SFA) to assess the efficiency of Sudanese Islamic banks. In a study conducted by Mokhtar, Abdullah, & Alhabshi (2008), the efficiency levels of Islamic banks in Malaysia were examined and compared to conventional banks using the DEA method. Similarly, Shahid et al. (2010) and Abbas, Azid, & Hj Besar (2016) had comparable aims, but they concentrated on Pakistani Islamic banks.

In accordance with Mokhtar, Abdullah, & Alhabshi (2008), and Ahmad & Rahim Abdul Rahman (2012) examined efficiency levels using a small sample of Islamic and conventional commercial banks in Malaysia. In the Indonesian Islamic banking context, Octrina & Mariam (2021) analysed efficiency through the SFA method. However, research conducted by Rusydiana & As-Salafiyah (2021) shows that most Islamic banks in Indonesia improved their efficiency during the study period, indicating advancements in performance.

Research has been conducted during the COVID-19 pandemic to comprehend its effect on banking performance. According to a recent study (Abdulla & Ebrahim, 2022), banks in Gulf Cooperation Council (GCC) countries were negatively impacted by the pandemic, with Islamic banks outperforming conventional banks. A study conducted by Boubaker,

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Le, & Ngo (2023) revealed that most Islamic banks faced inefficiencies amid the pandemic, with only a small number needing modifications to sustain their efficiency. In Indonesia, Hanafi, Rohman, & Sutapa (2022) found that Islamic banks experienced a decrease in financial performance amid the pandemic but demonstrated resilience.

Research has been conducted to analyse the influence of banking policies on bank performance. Le et al. (2022) discovered that monetary policy expansion impacted banks' performance and risk amid the COVID-19 pandemic. A study in Indonesia by Susilowati & Purnama (2022) found that countercyclical regulatory policies enforced by the Financial Services Authority (OJK) impacted the performance of banks with greater capital. In a recent study, Gržeta, Žiković, & Tomas Žiković (2023) found that larger banks generally outperform smaller banks, attributed to their well-organized structures and diversified asset portfolios. The studies emphasise the importance of comprehending banking efficiency when facing external challenges like global financial crises or pandemics. Efficiency is crucial for sustaining optimal performance and organisational resilience during uncertain circumstances.

During the COVID-19 pandemic, Islamic banks faced distinctive challenges. In a study conducted by Abdulla & Ebrahim (2022), it was discovered that Islamic banks in GCC countries outperformed conventional banks amidst the pandemic. Islamic banks with government affiliations and larger sizes were more significantly affected by the pandemic. In a recent study conducted by Boubaker, Le, & Ngo (2023), it was found that most Islamic banks experienced inefficiencies amid the pandemic. However, only a small number of them needed to make changes to sustain their efficiency. The research emphasises the significance of monitoring and managing efficiency in the banking sector, particularly during challenging circumstances like a pandemic. Banking authorities and regulators are essential in enforcing policies that enhance efficiency and bolster banking resilience. Nguyen, Nguyen, & Tram Tran (2022) and Susilowati & Purnama (2022) found that monetary and regulatory policies significantly influenced bank performance amid the pandemic. This highlights the impact of carefully developed policies on bank efficiency and risk.

Past studies emphasise the significance of efficiency in assessing banking performance. Past studies suggest that the COVID-19 pandemic has had a negative impact on the operational efficiency of banks globally. Moreover, countercyclical policies enforced by financial authorities have proven effective in bolstering the banking sector's resilience amid the pandemic. This study presents a new angle by analysing banking efficiency (Commercial Banks, Sharia Banks, Sharia Business Units, and Sharia Rural Banks) during the post-COVID-19 recovery period and assessing its impact on each type. This study enhances comprehension of banking efficiency and the consequences of countercyclical policies on different types of banks. The study's findings may assist banking authorities in fortifying the banking sector and improving operational effectiveness during difficult situations. The hyphotesis of this study as follows:

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H0: *Each DMU operates at suboptimal economic scale (ρ1 ≤ 1, ρ2 ≤ 1, ρ3 ≤ 1, ρ4 ≤ 1).*
H1: *At least one DMU operates at the optimal economic scale (ρ1 > 1 or ρ2 > 1 or ρ3 > 1 or ρ4 > 1).*

RESEARCH METHODOLOGY

The input-output relationships in financial institutions' behaviour are defined using the production, intermediation, and asset approaches in both parametric and non-parametric methods. Banking institutions act as financial intermediaries, and this research is based on the intermediation approach. The banking sector functions as an intermediary that transfers funds from surplus units to deficit units. Berger & Humphrey (1997) state that the intermediation approach is commonly used in banking efficiency research and is well-suited for assessing banks' overall efficiency because it considers interest expenses, which make up a significant portion of total costs (Elyasiani & Mehdian, 1990; Rusydiana & As-Salafiyah, 2021). The study's input variables include Total Funding (X1) and Total Operational Expenses (X2), with the output variables being Total Disbursed Credits (Y1), Total Assets (Y2), and Total Operating Income (Y3). The details of each variable are presented in Table 1.

Table-1: Description of Variables.

Variable	Short Form	Description	Unit	Source Reference
Input Variable				
Funding	X_1	Total Amount of (Saving + Demand Deposit), Collected from Indonesian Banking Statistic	IDR	Elyasiani & Mehdian (1990); Berger & Humphrey (1997); Rusydiana & As-Salafiyah (2021)
Operational Expenses	X_2	Total Operating Cost (Interest Expenses + Overhead Cost), Collected from Indonesian Banking Statistics	IDR	
Output Variable				
Credit/Lending	Y_1	Total loan. Collected From Indonesian Banking Statistics	IDR	
Asset	Y_2	Total Asset. Collected from Indonesia Banking Statistics	IDR	
Operating Income	Y_3	Total Operating Income (interest Income + fee-based income). Collected from Indonesia Banking Statistics	IDR	

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The study focuses on banks in Indonesia, comprising 106 Conventional Banks, 13 Sharia Banks, 20 Sharia Business Units, and 167 Sharia Rural Banks. Rural Conventional Banks were excluded because of incomplete data availability. The study covers two years before the pandemic (2018-2019), the peak pandemic period (2020), and the post-pandemic period (2021-2022). This study aims to enhance comprehension of banking efficiency in Indonesia amid and post the COVID-19 pandemic. Moreover, pertinent policy implications can be identified to enhance the banking sector and the overall financial system.

Efficiency scores are computed using Data Envelopment Analysis (DEA) for the examined banks, with values falling between 0 and 1. A score of 1 indicates efficiency for the bank, while a score below 1 indicates inefficiency. The DEA Frontier efficiency analysis offers efficiency values, identifies benchmark banks, and suggests potential improvements in input-output to enhance bank efficiency. The slack values in the DEA efficiency calculation table represent the necessary improvements in the input and output variables. This study identifies banks that effectively achieve maximum output without increasing input levels (Bhatia et al., 2018).

RESULT AND DISCUSSION

Indonesian banking statistics for the periods of December 2018, December 2019, December 2020, December 2021, and December 2022 provide data on funding, operational expenses, credit, assets, and operating income as shown in Table 2.

The summary of data on banking institutions in Indonesia shows details about different types of banks and their financial information from December 2018 to December 2022, as illustrated in Table 2. In December 2018, Conventional Banks reported total funding of Rp 6.475.110 billion and operating expenses of Rp 638.990 billion. From the provided data, Conventional Banks generated credit/lending of Rp 7.809.987 billion, had assets worth Rp 8.063.346 billion, and attained an operating income of Rp 820,646 billion. On the other hand, Sharia Banks had notably lower input volumes in comparison, with funding totaling Rp 257.606 and operational expenses of Rp 638.990 during that time frame. In December 2018, Sharia Banks reported Credit of Rp 7,809,987, Assets of Rp 8,068,346, and Operating Income of Rp 820,646.

In December 2018, the Sharia Business Unit documented inputs totaling Rp 114.222 billion and operating expenses of Rp 9.588 billion. From the information provided, the Sharia Business Unit generated credit/lending of Rp 117.895 billion, had assets worth Rp 160.636 billion, and attained an operating income of Rp 12.720 billion. The Sharia Rural Banks received funding of Rp 8.135 billion and incurred operational expenses of Rp 1.063 billion. This resulted in credit outputs of Rp 9.084 billion, assets totaling Rp 12.362 billion, and an operating income of Rp 1.303 billion.

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Table 2: Name of DMU, Input and Output (in billion rupiah).

Name of DMU	Input		Output		
	Funding	Operational Expenses	Credit (Lending)	Asset	Operating Income
Dec 18 Conventional Banks	6.475110	638.990	7.809.987	8.068.346	820.646
Dec 18 Sharia Banks	257.606	31.169	202.298	316.691	34.952
Dec 18 sharia Business Unit	114.222	9.588	117.895	160.636	12.720
Dec 18 Sharia Rural Banks	8.135	1.063	9.084	12.362	1.303
Dec 19 Conventional Banks	6.839.563	735.429	8.280.812	8.562.974	926.303
Dec 19 Sharia Banks	288.978	30.415	225.146	350.364	36.014
Dec 19 sharia Business Unit	127.580	12.029	130.036	174.200	15.420
Dec 19 Sharia Rural Banks	8.732	1.108	9.943	13.758	1.447
Dec 20 Conventional Banks	7.406.325	849.954	9.098.135	9.177.894	981.650
Dec 20 Sharia Banks	322.853	30.410	246.532	397.073	35.548
Dec 20 sharia Business Unit	143.124	11.568	137.412	196.875	14.649
Dec 20 Sharia Rural Banks	9.819	1.278	10.681	14.950	1.559
Dec 21 Conventional Banks	8.129.720	889.655	10.114.135	10.112.304	1.064.432
Dec 21 Sharia Banks	365.421	32.861	256.219	441.789	38.969
Dec 21 sharia Business Unit	171.572	11.314	153.659	234.947	15.564
Dec 21 Sharia Rural Banks	11.592	1.177	16.033	17.060	2.000
Dec 22 Conventional Banks	8.925.472	933.289	11.065.740	11.113.321	1.186.632
Dec 22 Sharia Banks	429.029	32.966	322.599	531.860	42.657
Dec 22 sharia Business Unit	177.034	13.556	168.890	250.240	17.386
Dec 22 Sharia Rural Banks	13.446	1.359	14.448	20.157	2.580

Even amidst the challenges posed by the COVID-19 pandemic, the increase in assets for every bank in Indonesia has remained consistently optimistic. In 2020, the assets of commercial banks saw a rise from 6% to 7%, while Sharia banks experienced an

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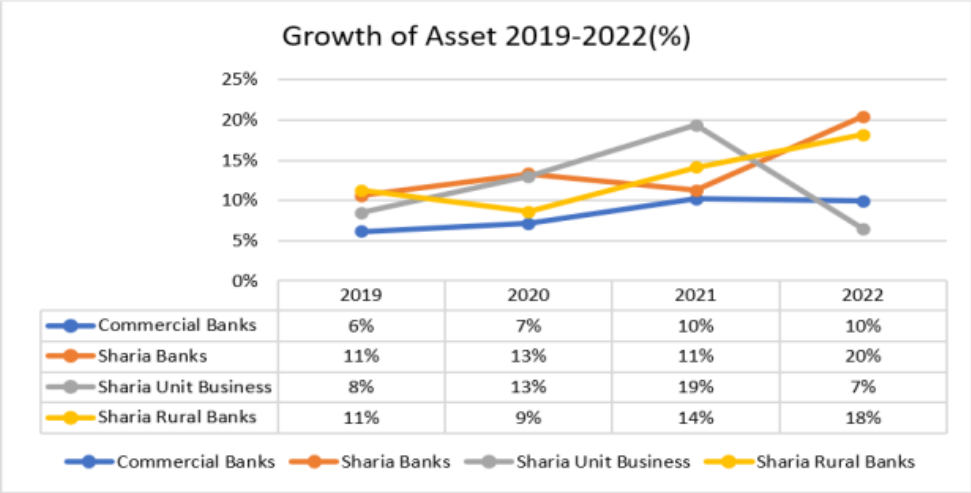
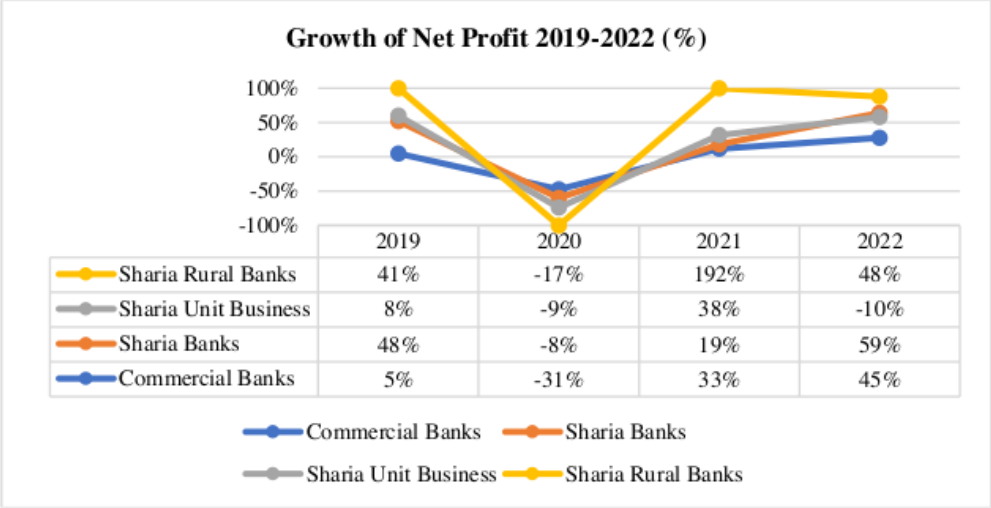
increase from 11% to 13%, and Sharia Unit Businesses' assets grew from 8% to 13%. Nevertheless, Sharia Rural Banks saw a decrease in growth from 11% to 9%. The data presented in these figures show that the COVID-19 pandemic did not impede the expansion of bank assets in Indonesia.



	2019	2020	2021	2022
Commercial Banks	6%	7%	10%	10%
Sharia Banks	11%	13%	11%	20%
Sharia Unit Business	8%	13%	19%	7%
Sharia Rural Banks	11%	9%	14%	18%

Figure 2: Growth of asset (%) Indonesian Bank.

From 2019 to 2022, there was a noticeable increase in total banking assets. However, in 2020, amidst the COVID-19 pandemic peak, all banks saw a decline in Net Profit growth. To determine the Net Profit, subtract Total Operating Expenses from Total Operating Income. In 2021, all financial institutions adjusted their growth trajectory, bouncing back to growth. Regrettably, businesses in the Sharia unit once again saw a decline in Net Profit growth in 2022. It is evident that in 2020, amidst the height of the COVID-19 crisis, all banks faced a decrease in their total profits. Figure 3 displays the percentage growth of net profit from 2019 to 2022.



	2019	2020	2021	2022
Sharia Rural Banks	41%	-17%	192%	48%
Sharia Unit Business	8%	-9%	38%	-10%
Sharia Banks	48%	-8%	19%	59%
Commercial Banks	5%	-31%	33%	45%

Figure 3: Growth of Net Profit 2019-2022 (%).

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Examining the expansion of inputs and outputs across various banking institutions, Table 3 below provides a comparison of the total inputs and outputs of the entire banking sector in Indonesia from 2018 to 2022.

Table 3: Input and Output 2018-2022 in billion Rupiah.

Input and Output	2018	2019	2020	2021	2022
Total Funding	6.850.137	7.247.843	7.811.985	8.648.498	9.544.981
Total Operating Expenses	676.725	776.771	813.353	932.327	981.169
Total Credit	8.241.112	8.734.840	9.574.852	10.655.339	11.571.678
Total Asset	8.560.888	9.101.296	9.786.792	10.806.099	11.915.578
Total Operating Income	869.621	979.184	1.033.406	1.120.965	1.249.255

The table above shows that all banks have been consistently growing in Total Funding, Total Operating Expenses, Total Credit, Total Asset, and Total Operating Income. The rise in numbers shows that the banking industry in Indonesia is experiencing strong expansion prior to, during, and post the COVID-19 outbreak. The diagram below shows the increasing trend of all input and output components in the Indonesian banking industry.

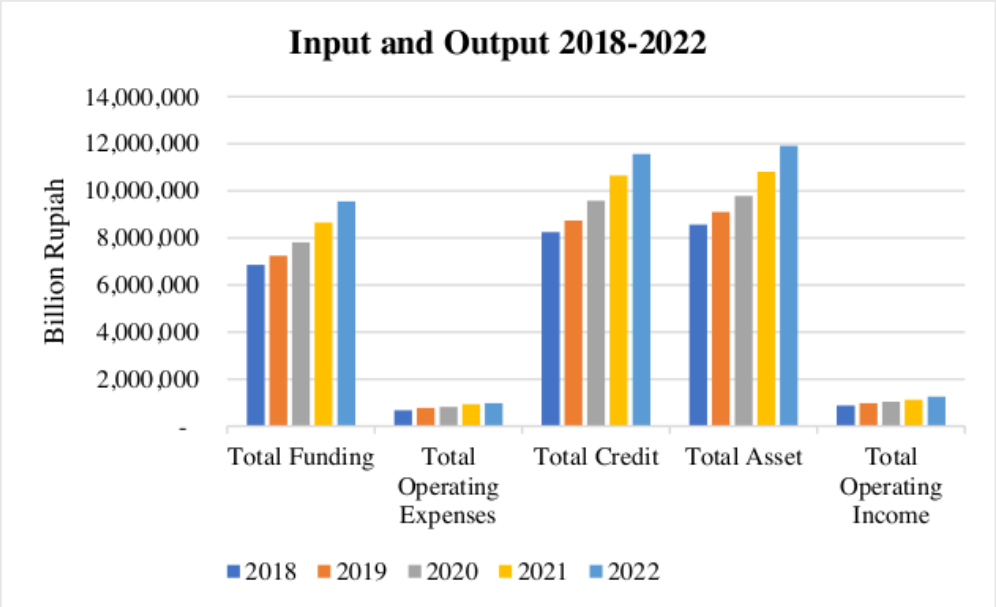

Figure 4: Input and Output of Banks in Indonesia 2018-2022.

Table 4 shows the shares of different types of banks and business units. When analysing market shares from 2020 to 2022, it is evident that there has been a rise in the share of Total Sharia, increasing from 6% in 2020 to 7% in 2022. Nevertheless, the commercial bank's share dropped from 93.78% in 2020 to 93.27% in 2022.

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Table 4: Share of Asset between Commercial Bank and Total Sharia Bank.

Type of Banks	Dec-20	Share	Dec-21	Share	Dec-22	Share
Commercial Banks	**9.177.894**	**93,78%**	**10.112.304**	**93,58%**	**11.113.321**	**93,27%**
Sharia						
Sharia Banks	397.073	4,06%	441 789	4,09%	531.860	4,46%
Sharia Unit Business	196.875	2,01%	234 947	2,17%	250.240	2,10%
Sharia Rural Banks	14.950	0,15%	17.060	0,16%	20.157	0,17%
Total Sharia	**608.898**	**6%**	**693.795**	**6%**	**802.257**	**7%**
Total Commercial and Sharia	**9.786.792**	**100,00%**	**10.806.099**	**100,00%**	**11.915.578**	**100,00%**

Indonesia's banking sector has demonstrated notable resilience amid the pandemic, largely attributed to the swift actions taken by the Financial Services Authority (OJK) in response to the effects of COVID-19. Issued in March 2020, Regulation Number 11/POJK.03/2020 on the National Economic Stimulus as a Countercyclical Policy in Response to the Spread of COVID-19 was in effect until March 31, 2021. The National Economic Stimulus was designed to mitigate the effects of COVID-19 by offering credit restructuring measures to ease the financial strain on the affected population, particularly focusing on Small and Medium Enterprises (SMEs) encountering credit challenges. The restructuring of credit was carried out through a variety of methods, including decreasing interest rates, extending the repayment period, decreasing principal arrears, reducing interest arrears, providing credit facilities, and temporarily converting credit into equity participation. Evaluating the credit or financing quality depended only on the prompt payment of principal and/or interest, with a maximum limit of Rp10 billion. Moreover, the credit or financing quality was improved to "performing" following the restructuring period, which remained in effect until March 31, 2021.

Thanks to this countercyclical COVID-19 policy, we have seen a positive outcome. By August 2021, a sum of Rp770.76 trillion has been restructured, providing benefits to 5.81 million debtors. The restructuring programme implemented for the banking sector has enhanced credit quality, thus averting the classification of loans as non-performing. As of August 2021, the NPL ratio was relatively low, standing at 3.35%. Due to the continued global and domestic spread of COVID-19, the Financial Services Authority (OJK) extended the economic stimulus policy through Regulation No. 48/POJK.03/2020, which amended Regulation No .

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11/POJK.03/2020 on the National Economic Stimulus as a Countercyclical Policy in Response to the Spread of Coronavirus Disease 2019. This regulation was implemented as a preventive and ongoing step to promote top banking performance, uphold financial system stability, and boost economic growth, all while adhering to prudent principles and preventing moral hazard. The regulation eased the burden of employee education costs by lowering it from 5% to less than 5%. This offer is valid until March 31, 2022.

Moreover, in August 2021, the OJK granted an extension of credit restructuring relaxation for the banking sector until March 2023 via Regulation No. 17/POJK.03/2021. The research findings back up the study done by Susilowati & Purnama (2022), indicating that the countercyclical regulatory policy enforced by the Financial Services Authority (OJK) affects bank performance.

Through the DEA Frontier analysis using the VCR approach, we can see the influence of the coronavirus outbreak on banking efficiency through the efficiency scores of each bank. When banks reach an efficiency score of 1, they are classified as efficient. If their scores fall below 1, they are labelled as inefficient. The results of the DEA Frontier calculations for the efficiency of each bank from 2018 to 2022 are shown in Table 3. The table covers the period before the outbreak, during the pandemic in 2020 and 2021, and after the pandemic in 2022, during the resilience phase.

Table 5: Efisiensi DMU Dec 18-Dec 2022.

Date	Conventional Bank	Sharia Bank	Sharia Business Unit	Rural Sharia Bank
Dec-18	1.00000	0.98084	1.00000	1.00000
Dec-19	1.00000	0.94114	1.00000	1.00000
Dec-20	0.99432	0.92431	0.97608	0.97643
Dec-21	1.00000	0.91843	1.00000	1.00000
Dec-22	1.00000	1.00000	1.00000	1.00000

The table above shows the results of hypothesis testing indicating that Conventional Banks, Sharia Business Units, and Rural Sharia Banks were operating efficiently in 2018, 2019, and 2022. Sharia Banks faced inefficiency in the years 2018, 2019, 2020, and 2021, finally achieving efficiency in 2022. In 2020, at the height of the COVID-19 pandemic, all banks experienced inefficiencies. In 2021, during the post-COVID-19 recovery phase, Conventional Banks, Sharia Business Units, and Rural Sharia Banks all improved their efficiency, whereas Sharia Banks continued to lag behind in terms of efficiency. By the year 2022, all banks had achieved efficiency. This research presents results that go against the study carried out by Abdulla & Ebrahim (2022), which indicated that Islamic banks in GCC countries showed stronger performance than conventional banks amid the pandemic. On the other hand, this study aligns with the results of Boubaker, Le, & Ngo (2023), showing that most Islamic banks faced inefficiencies during the pandemic and needed to make changes to sustain their efficiency.

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Moreover, the values for the input and output items that contribute to the inefficiency of each bank can be seen in Table 4. In 2018 (pre-pandemic), Sharia Banks showed inefficiency in operational expenses totaling Rp 3,486.92 billion, as well as in Financing and Assets amounting to Rp 101,848.58 billion and Rp 2,852.77 billion, respectively. In 2019, there were inaccuracies in the input of operational expenses totaling Rp 418.78 billion and inefficiencies in the output of Financing totaling Rp 88,903.03 billion. During the peak of the pandemic in 2020, Sharia Banks showed inefficiency in the input of operational expenses amounting to Rp 236.32 billion and inefficiency in the output of Financing amounting to Rp 80,609.41 billion. In the year 2021 (end of the pandemic), Sharia Banks displayed inefficiency in the output of Financing amounting to Rp 115,292.55 billion.

Table 6: Input Slack and Output Slacks.

VRS Model Slacks		*Input Slacks*		Output Slacks		
DMU No.	**DMU Name**	***Funding***	***Operational Expenses***	**Financing**	**Aset**	**Profit**
1	Dec 18 Sharia Banks	0.00	3486.92	101848.58	2852.77	0.00
2	Dec 19 Sharia Banks	0.00	418.78	88903.03	0.00	0.00
3	Dec 20 Conventional Banks	0.00	72038.89	0.00	0.00	0.00
4	Dec 20 Sharia Banks	0.00	236.32	80609.41	0.00	0.00
5	Dec 20 sharia Business Unit	0.00	66.71	1410.25	0.00	0.00
6	Dec 20 Sharia Rural Banks	0.00	80.92	72.09	0.00	0.00
7	Dec 21 Sharia Banks	0.00	0.00	115292.55	0.00	0.00

Collectively, traditional banks faced operational expense inefficiencies of Rp 72,038.89 billion at the height of the 2020 pandemic. A similar scenario unfolded with Sharia Business Units, experiencing operational expenses inefficiency of Rp 66.71 billion and output financing inefficiency of Rp 1,410.25 billion. Similarly, Sharia Rural Banks experienced inefficiencies in input operational expenses totaling Rp 80.92 billion and inefficiencies in output financing totaling Rp 72.09 billion.

In order to enhance efficiency using the DEA VRS model targeting process, the optimal input and output values were computed for each Conventional Bank, Sharia Bank, Sharia Business Unit, and Sharia Rural Bank in the years 2018, 2019, 2020, and 2021, as outlined in Table 7 below.

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Table 7: Efficient Input Target and Efficient Output Target (VRS Model Target).

DMU No.	DMU Name	Efficient Input Target		Efficient Output Target		
		X1	X2	Y1	Y2	Y3
1	Dec 18 Sharia Banks	252,670.53	27,084.73	304,146.91	319,544.09	34,952.29
2	Dec 19 Sharia Banks	271,967.82	28,205.54	314,048.79	350,363.54	36,013.61
3	Dec 20 Conventional Banks	7,364,281.15	773,089.71	9,098,134.54	9,177,893.58	981,649.82
4	Dec 20 Sharia Banks	298,416.06	27,872.40	327,141.85	397,072.97	35,547.73
5	Dec 20 sharia Business Unit	139,700.31	11,224.18	138,822.26	196,875.02	14,649.48
6	Dec 20 Sharia Rural Banks	9,587.63	1,166.53	10,753.60	14,950.46	1,558.99
7	Dec 21 Sharia Banks	335,615.38	30,180.50	371,511.89	441,788.83	38,968.63

CONCLUSION AND IMPLICATION

Even with the obstacles encountered during the pandemic, the banking sector in Indonesia has maintained a growth trajectory throughout the pandemic and the subsequent recovery phase. This study emphasises the important role of the Financial Services Authority (OJK) as a regulator in implementing countercyclical regulatory policies that successfully reduced the pandemic's effects on the banking sector. The regulations on credit restructuring and economic stimulus have played a crucial role in ensuring the stability of the banking sector amidst challenging circumstances.

Indonesia's banking sector has shown strength in handling the economic challenges brought on by COVID-19. The analysis of Data Envelopment Analysis (DEA) shows that all banks faced inefficiency in 2020 amid the pandemic. Together, traditional banks, Sharia-compliant business units, and Sharia rural banks demonstrated higher efficiency levels before and after the pandemic in comparison to Sharia banks.

The factors related to operating expenses and credit disbursement contribute to the inefficiency of the entire banking sector. Sharia Banks faced inefficiencies both prior to and during the COVID-19 pandemic. It was only in 2022 that Sharia Banks were able to achieve efficiency, showing that they needed more time to recover and adjust to the post-pandemic conditions.

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This study suggests that banking authorities globally should develop countercyclical policies to tackle economic threats that could affect the banking sector's performance. Taking proactive steps and implementing necessary regulatory actions can ensure stability and assist banks in navigating through crises.

This study suggests exploring additional research on countercyclical policies adopted by other nations during pandemics or economic crises. Studying comparisons like this can offer valuable insights into developing effective policy strategies and measures to strengthen the banking sector's resilience.

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