East Asian Journal of Multidisciplinary Research (EAJMR)
Vol. 3, No. 12, 2024 : 5729 – 5746

Comparative Analysis of Bank Efficiency in Indonesia, United States, and China Data Envelope Analysis Approach

Moh. Rizqy Eka Putra[1*], Tony Seno Aji[2]
Economics Study Program, Faculty of Econmics and Business, State University of Surabaya
Corresponding Author: Moh. Rizqy Eka Putra mohputra.21048@mhs.unesa.ac.id

A R T I C L E I N F O

Keywords: DEA, Banking Efficiency, Indonesia, United States, China

Received : 06, November
Revised : 20, November
Accepted: 21, December

A B S T R A C T

The rapid advancement of technology has significantly influenced the financial sector, driving the digitalization of banking, especially post-COVID-19. This study analyzes banking efficiency in Indonesia, the United States (US), and China from 2019–2023 using the Data Envelopment Analysis (DEA) method. Results reveal that US banks maintain the highest and most stable efficiency (average 0.99), followed by China with a positive trend (average 0.98), and Indonesia with stable but slightly lower efficiency (average 0.97). Key findings highlight US efficiency stability, China's upward trend, and Indonesia's credit risk management challenges. Recommendations include enhancing risk management in Indonesia, sustaining efficiency in the US, and improving cost efficiency in China.

DOI prefix: https://doi.org/10.55927/eajmr.v3i12.12489
ISSN-E: 2828 – 1519
https://journal.formosapublisher.org/index.php/eajmr

INTRODUCTION

Banking has an important role in a country because it can improve and help the expansion and development of the country's economy. In countries like China, the United States and Indonesia, banks play a very big role. Foreign banks have played an important role in financing public and private development initiatives in Indonesia, shaping banks' competitive practices, and influencing the country's economy(Haryanto, 2018). During a crisis such as the Covid-19 outbreak, Indonesia's central bank plays an important role in the country's economic recovery (Afifah et al., 2022). On the other hand, banks have also played an important role in driving domestic growth in the United States after the global financial crisis, due to their large financial contribution to the economy (Ding et al., 2017). Diversity among banks in the United States is also very important. proven to have a positive impact on regional sectoral output growth, thereby reducing the negative impact of the financial crisis(Ghosh, 2018). Meanwhile in China's banking sector, a single centralized banking system was replaced by a two-tier banking system, with the People's Bank of China taking the role of central bank. Chinese banks simultaneously manage and trade assets, with income and market investment risks influencing loan and financial asset portfolios (Wang et al., 2018).

The banking sectors in Indonesia, the United States and China face various challenges that affect their stability and growth. In Indonesia, the Islamic banking sector faces difficulties in expanding its market share when compared to conventional banks, this shows a lack of competitiveness (Ibrahim et al., 2020). In addition, disruptions such as the COVID-19 pandemic also pose significant risks to the stability of the Indonesian financial system (Ilyas & Setyorini, 2023). The development of sharia banking in Indonesia is hampered by challenges such as inadequate capital, limited practitioner expertise, lack of government support, and low public trust (Rusydiana, 2016). In addition, intense competition in the Indonesian banking industry can contribute to financial system instability (Siregar et al., 2019).In the US, the banking industry was affected by structural imbalances stemming from events such as the COVID-19 pandemic and the 2008 financial crisis, which impacted overall banking performance (Pasha, 2023). The rise of digitalization presents further challenges, as technological advances impact various sectors, including banking (Sasea & Sakmaf, 2023). Additionally, the transformation towards digital banking is hampered by regulatory challenges in the United States(Onyeka Chrisanctus Ofodile et al., 2024) .

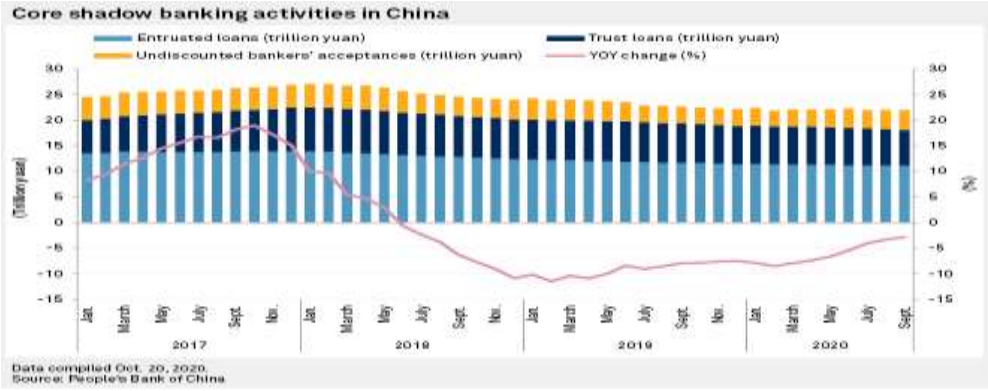

Figure. 1 Core shadow banking activities in China

In China, the banking industry faces challenges regarding risk management, especially after the entry of foreign banks into the market (Nayak & Xu, 2018). Liquidity risks and inefficiencies in BPRs highlight the need for improved fund allocation and cost management strategies(Zafrizal et al., 2021). Additionally, the expansion of shadow banking in China has raised concerns, as its rapid growth has reduced anticipated declines in traditional bank lending and weakened the effectiveness of policies monetary (Chen et al., 2018). To address these issues, it is critical to implement strong risk management practices, strengthen regulatory oversight, and leverage technological innovation to enhance the resilience and competitiveness of China's banking sector.

Figure. 2 Conventional bank performance indicators

An efficient banking system is critical to maintaining economic stability and driving growth in countries such as Indonesia, the United States and China. Bank efficiency plays an important role in the allocation of financial resources, investment activities, and overall economic performance. Factors such as foreign ownership, corporate restructuring, prudential regulation, and consolidation have been identified as major contributors to improving the efficiency of commercial banks (Grigorian & Manole, 2006). In Indonesia, the efficiency of commercial banks is influenced by factors such as non-performing loans, loan to deposit ratio, capital adequacy ratio, bank size, and economic growth (Sari et al., 2022). Efficient banking operations are very important to support macroeconomic policies and maintaining development, which in turn has an impact on economic growth and social welfare (Christianti, 2021).

An efficient banking system not only contributes to economic stability but also has a positive impact on economic growth by channeling credit and financing to the real sector, improving people's welfare and reducing inequality (Agustina et al., 2023). Apart from that, banking efficiency has been proven to have a positive effect on regional economic growth . Overall, bank efficiency in these countries is critical to ensuring financial stability, driving economic growth, and improving the overall welfare of society.The rapid growth of the digital economy, driven by financial technology (fintech), has significantly transformed the banking sector. These changes began before the pandemic but accelerated during and after it, as businesses shifted towards digital solutions. The unification of services and networks in digital financial services aims to provide customers with more tailored experiences.

Since the COVID-19 pandemic, financial digitalization has become more prominent, with contactless payments offering a more practical and secure way to transact. Research shows that touchless transactions increased by 69% since January 2020. In Indonesia, many consumers prefer peer-to-peer lending, QR Code payments, and mobile banking, with older generations still relying more on cash.Technological advances have drastically changed banking, enabling automation, online banking, and 24-hour access. Innovations like digital wallets, cardless ATM withdrawals, and investment management apps have reshaped the customer experience. As banks transition to digital systems, data protection and cybersecurity have improved.Digitalization has greatly benefited the banking industry, but its efficiency depends on customers' ability to use new technologies. A lack of digital skills in society remains an obstacle to fully realizing the benefits of digital banking. This research differs from previous studies by analyzing the efficiency of conventional banking in Indonesia and Malaysia in the digital era, rather than focusing on sharia banking.The complexity of banking operations, especially with the integration of advanced financial technologies, requires careful analysis. Using the right analytical models can help banks reduce losses, increase profits, and optimize resource allocation, enhancing overall efficiency in the sector.

Efficiency in a country's banking sector is very important because it has a significant impact on various aspects of the economy, especially in Indonesia, China and the United States. Efficient banking operations are critical to enhancing financial stability, increasing economic growth, and improving overall economic performance. The effectiveness of a country's banking efficiency is very important to ensure appropriate resource allocation, encourage investment activity, and support sustainable economic development (Fan, 2016).According to Eugenia (2009), Various methods can be used to measure efficiency, including non-parametric methods such as Data Envelopment Analysis (DEA) and parametric methods such as the Stochastic Frontier Approach (SFA)(Hadad et al., 2003). The efficiency score in DEA depends on the efficiency level of each bank being analyzed. The ability to achieve the highest possible output using available input is considered the expected standard of performance. The banking sector faces the challenge of determining how to achieve optimal levels of output using existing inputs or

how to achieve certain levels of output with minimal inputs when measuring efficiency.

There are differences and updates in this research compared to previous banking efficiency studies. First, there has been no research comparing banking efficiency in Indonesia, China and the United States. Then there has been no comparative research on banking efficiency that uses 3 banking categories directly. And finally, this research not only measures how efficient the banking is but also pays attention to the aspects that make one bank more efficient than others.Overall, effective banking efficiency in Indonesia, China, and the United States is critical to driving economic progress, ensuring financial stability, and promoting sustainable development. Efficient banking operations are fundamental to supporting economic activities, improving financial intermediation, and improving overall economic prosperity in these countries.

THEORETICAL REVIEW

Efficiency

In economic activities, efficiency focuses on the creation of goods and services at minimum costs and the allocation of economic resources to their most valuable uses (Taswan, 2006). In the context of production cost theory, the Cobb-Douglas function is used to analyze how the optimal combination of labor (L) and capital (K) can minimize costs for a certain level of output. Production cost theory explains that production costs consist of fixed costs and variable costs.The Cobb-Douglas production function is a model commonly used in economics to describe the relationship between production inputs (such as labor and capital) and the output produced. This function is often used in production cost analysis because it allows us to understand how changes in production inputs affect output. Efficiency theory in banking is an important concept in economics and financial management, which emphasizes a bank's ability to optimize resource utilization to reduce costs and maximize profits. The following are several theories related to banking efficiency:

1. Technical Efficiency Theory
   Technical efficiency theory relates to a bank's ability to maximize output from existing inputs. Banks that are technically efficient are able to produce the same amount of output using less input compared to other banks. Technical Efficiency Theory in the banking industry focuses on a bank's ability to utilize resources and technology effectively to maximize output from a given set of inputs. This plays an important role in optimizing operational processes, increasing productivity, and minimizing waste in banking operations (Samad, 2019).
2. Scale Efficiency Theory
   Scale Efficiency Theory in the context of the banking industry refers to the concept of optimizing operational scale to achieve maximum efficiency and productivity. This involves assessing the relationship between the scale of a bank's operations and its efficiency in utilizing resources to produce output (Miller & Muir, 2020).

Digitalzarion of the Banking Financial Sector

1. The banking industry is experiencing a significant shift driven by internal and external factors, especially the digital era. Banks must adapt quickly to develop innovative digital banking services to increase financial inclusion, as the sector evolves in response to advances in fintech and the digital revolution. This shift marks the banking industry's entry into the era of digital banking services which aims to provide financial inclusion and enable access to services anytime and anywhere.
2. The new digital era is characterized by rapid and continuous change, which is forcing banks to change their business models and introduce new products and services through digitalization. This transformation reflects the banking sector's recognition of the importance of markets. However, as stated by Mekinjić (2019), banks will face big challenges in the future due to intense market competition (Mekinjić, 2019).

Digitalization of the Banking Financial Sector

Farrell (1957) introduced the concept of DEA, which evaluates the effectiveness of a technique by converting the use of one input and one output to a system with many inputs and outputs. DEA assesses relative efficiency by comparing the ratio between input and output, and this analysis method has been widely accepted by various researchers. Irawati (2021:41) states that the Data Envelopment Analysis (DEA) method is a tool that is widely used to assess efficiency, especially in measuring the relative efficiency of an organization or company . This measurement is expressed through decision-making units (DMUs), which compare the efficiency of one DMU with other DMUs in the same sample. DEA is particularly useful when dealing with complex relationships between inputs and outputs, which are often not well understood or easily explained by other methods. Zaharuddin et al. (2021:121) emphasizes the importance of selecting factors that cannot be controlled through statistical regression against the efficiency index derived from DEA. Significant environmental factors are then included in the DEA model to determine their impact on efficiency (Jessica et al., 2022).

According to Irawati (2021:40), the DEA method approach can be carried out in three ways:

1. Production Approach: This approach views banks as service producers that utilize labor, capital, and equipment to produce financial services, such as payments and credit. Output and input are determined by quantities, such as the number of accounts or employees.
2. Profit Approach: This approach focuses on bank profitability, where expenses (e.g., interest paid, labor costs) are treated as inputs and income (e.g., interest and non-interest income) as output.
3. Intermediation Approach: This approach views banks as intermediaries between fund providers and users. Input includes operational costs and total savings, while output includes total credit and income.

Banking Efficiency in Indonesia, US, and China

According to Antunes et al. (2022), The findings show that the efficiency of Chinese banks increased steadily until 2015, reaching a peak score of 0.915, then declined and ended at 0.746 at the end of 2018. State-owned banks were the most efficient, while foreign banks were the most volatile. Bank size and non-traditional businesses have a positive impact on efficiency, while profitability, traditional businesses, and cost management have a negative impact. Lee et al. (2021) found that state-owned banks have the lowest cost efficiency and use lower technology. Fintech innovation not only improves cost efficiency, but also the technology used by banks, with the greatest impact seen in innovation in market support services. Beside that, Liao (2020)shows that that China's rapid economic growth is improving bank efficiency. This emphasizes the importance of ongoing cross-strait negotiations for future services trade agreements. The results also show that ignoring undesirable outcomes in the model can cause serious distortions in efficiency results. Fan (2016) found that The efficiency of commercial banks in China has generally improved, mainly due to improvements in scale efficiency, while pure technical efficiency has stagnated. Scale efficiencies show convergence across bank types, with technical efficiencies key to current and future competition. Jiang & He (2018) show that the Chinese government implements a macroprudential framework in banking supervision, which helps listed banks overcome financial risks and achieve stable growth. This framework is believed to contribute positively to economic development and financial stability in China.

Ferrara & Kounetas (2024)found that persistent efficiency was more significant, accounting for 32% of the production and 39% of the cost function of total inefficiency. Most banks experience increasing returns to scale in production and costs, regardless of bank ownership or size.(Doan et al., 2018) found that State-owned banks with unstable revenues tend to be less efficient in income diversification. More diversified foreign banks are less efficient in developed countries, whereas increased foreign ownership of banks in developing countries increases the benefits of diversification after a financial crisis. Ferreira-Silva et al. (2024)show that banks that are larger, have better capital, are more profitable, with lower credit risk and less diversified income sources, are the most efficient banks.

Hardiyanti & Haryanto (2022) found that bank efficiency in Indonesia is influenced by credit risk, size and CAR. Banks with high credit risk tend to be less efficient because they have to allocate more resources. In addition, larger banks tend to be less efficient, indicating that economies of scale have not yet been achieved at the national level (Hardiyanti & Haryanto, 2022).Christianti (2021) shows that DEA results show that inefficient banks can achieve maximum efficiency by reducing inputs such as labor costs, fixed assets, and deposit amounts. Competition and limited management control over some inputs make it difficult for some large banks to maintain consistent efficiency.

METHODOLOGY

The method used by the author in this research is quantitative. Quantitative methods are a research approach that is in line with positivist philosophy. It is used to investigate a particular population or sample by using research instruments for data collection. Through quantitative data analysis, the aim is to test the hypotheses that have been established (Sugiono, 2014:11).The research design used in this research is the Data Envelope Analysis (DEA) approach. DEA is a non-parametric technique that is widely used to evaluate bank efficiency. Radojicic et al. (2018)present an extraordinary bibliographic review of banking efficiency studies using the DEA technique.

The population in this research is banks in Indonesia, the United States and China. Meanwhile, the samples used are 10 banks (national banks, regional banks and specialized banks) for each countries with the provision of publishing complete financial reports for the 2019-2023 period. This research uses 3 input variables and 2 output variables. The following is the definition of operational variables useed. The input variables are Deposits, Assets, and Operational Cost. Then, the output variables are Total Credit Distribution and Operational Profit

RESULTS AND DISCUSSION

DEA Test Result

The DEA test results that have been carried out regarding banking efficiency calculations can be shown in the table below :

TABLE. 1 Indonesian Banking Efficiency Calculation Results

No.	Bank Code	2019	2020	2021	2022	2023
1	BNI	100%	100%	100%	100%	100%
2	BRI	100%	100%	100%	100%	100%
3	BMRI	100%	100%	100%	100%	100%
4	BTN	100%	100%	100%	100%	100%
5	BJB	100%	100%	100%	100%	100%
6	BDKI	100%	100%	100%	100%	100%
7	BJTM	93.30	84.60	70%	100%	100%
8	BSMT	100%	100%	100%	81%	73.50
9	BSI	100%	100%	100%	88.30	100%
10	BDMN	100%	89.60	98%	100%	100%

Based on the table above, banks in Indonesia show varying levels of efficiency. A bank is considered efficient if it has a score of 100%, while a value close to 0 indicates inefficiency. Four state-owned bank BNI, BRI, BMRI, and BTN consistently recorded an efficiency score of 100% from 2019 to 2023. This

consistency shows strong operational performance over the past few years.Regional banks show greater variation in efficiency. BJB and BDKI maintained an efficiency score of 100% from 2019 to 2023, indicating operational stability. However, BJTM efficiency fell from 93.3% in 2019 to 70% in 2021, before increasing again to 100% in 2022 and 2023. BSMT efficiency decreased from 100% in 2019 to 73.5% in 2023, indicating the need for increased efficiency.

Specialized banks, such as BSI and BDMN, also show efficiency fluctuations. BSI maintained efficiency for most of the year, although it dropped to 88.3% in 2022 before returning to 100% in 2023. BDMN experienced a decline in efficiency in 2020 with a score of 89.6% but returned to 100% from 2021 to 2023 . This shows the ability of these specialized banks to improve efficiency after a temporary decline. Overall, state-owned banks demonstrated strong and consistent efficiency, while some regional and specialized banks experienced fluctuations, reflecting different operational challenges. Regional banks such as BJTM and BSMT experienced a decline in efficiency but have shown improvement recently. Although some banks have struggled to maintain consistent efficiency, they have shown a positive recovery trend in recent years.

TABLE. 2 United States Banking Efficiency Calculation Results

No.	Bank Code	2019	2020	2021	2022	2023
1	JPM	100%	100%	100%	100%	100%
2	BAC	100%	100%	100%	87.10	83%
3	WFG	100%	100%	100%	100%	100%
4	PNC	100%	100%	100%	100%	100%
5	FITB	100%	100%	90.90	100%	100%
6	MNT	100%	100%	100%	100%	100%
7	KYB	100%	100%	100%	100%	100%
8	RFC	100%	100%	100%	100%	100%
9	AMEB	100%	100%	100%	100%	100%
10	COFC	100%	100%	100%	100%	100%

Based on the table above, banks in the United States show varying levels of efficiency. A bank is considered efficient if it has a score of 100%, while a value close to 0 indicates inefficiency. Several large banks, such as JPM, WFG, PNC, MNT, KYB, RFC, AMEB, and COFC, consistently maintained an efficiency score of 100% from 2019 to 2023, indicating strong operational performance during this period.However, some banks show fluctuations in efficiency. For example, BAC recorded a consistent 100% efficiency from 2019 to 2021, but fell to 87.1% in 2022 and further dropped to 83% in 2023. This decline

shows the challenges in maintaining optimal efficiency in recent years. Likewise with FITB, which experienced a slight decrease in efficiency in 2021 to 90.9% but returned to 100% in 2022 and 2023, reflecting efforts to improve efficiency.

Overall, most banks show strong and consistent efficiency trends, especially those that consistently maintain a score of 100%. Despite this, banks such as BAC and FITB have faced some difficulties in maintaining this consistency, with BAC in particular experiencing a gradual decline in the last two years. This shows that although most banks are able to demonstrate resilience in efficiency, some face operational challenges that impact performance over time.

TABLE. 3 Chineese Banking Efficiency Calculation Results

No.	Bank Code	2019	2020	2021	2022	2023
1	ICBC	100%	100%	100%	100%	100%
2	CCB	100%	100%	100%	100%	100%
3	ABC	86.70	100%	100%	98%	94%
4	BOC	100%	100%	100%	99%	100%
5	SPDB	100%	83.80	100%	100%	100%
6	CMB	100%	100%	100%	100%	100%
7	BOB	100%	100%	100%	100%	100%
8	BON	100%	100%	100%	100%	100%
9	CMCB	100%	100%	100%	97%	100%
10	PSBC	100%	84.60	100%	86%	86%

Based on the table above, banks in China show varying levels of efficiency. A bank is considered efficient if it has a score of 100%, while a value close to 0 indicates inefficiency. The four state-owned banks—ICBC, CCB, ABC, and BOC—show different efficiency trends. ICBC and CCB maintained consistent 100% efficiency scores from 2019 to 2023, demonstrating strong operational stability. However, ABC experienced some fluctuations, with efficiency dropping to 86.7% in 2019, reaching 100% in 2020 and 2021, but decreasing again to 98% in 2022 and 94% in 2023. BOC also maintained high efficiency, although it fell slightly to 99% in 2022 before returning to 100% in 2023.

Regional banks also show variations in efficiency. For example, SPDB recorded a decline to 83.8% in 2020 but managed to return to full efficiency from 2021 to 2023. Meanwhile, CMB, BOB, and BON consistently achieved 100% efficiency over those five years, indicating good operational performance .

Specialized banks, namely CMCB and PSBC, show quite significant variations in efficiency. CMCB maintains high levels of efficiency, with a slight decline to 97% in 2022 before returning to 100% in 2023. PSBC, on the other hand, experiences greater fluctuations, with 100% efficiency in 2019, dropping to 84.6% in 2020, returns to 100% in 2021, but falls again to 86% in 2022 and 2023.Overall, although state-owned banks and some regional banks demonstrate strong and consistent efficiency, some specialized banks face ongoing operational challenges that impact their ability to maintain optimal levels of efficiency.

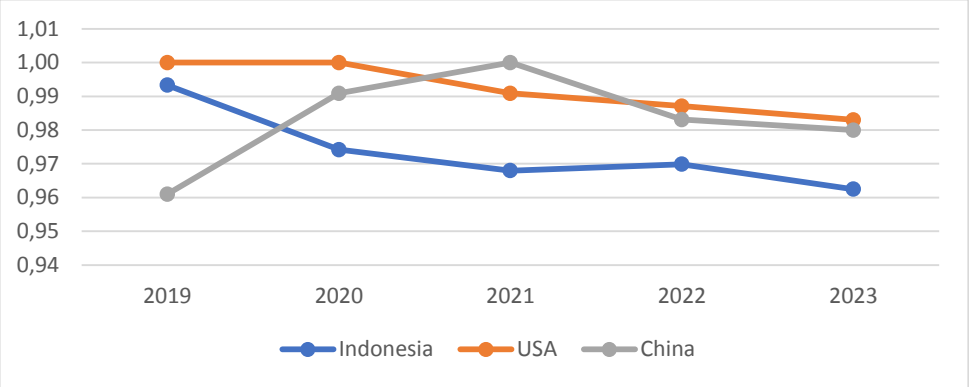

Fig. 3 Comparison of Indonesian, American, Chinese Banking Performance Efficiency

Based on the data above, banking in Indonesia shows a stable level of efficiency, with an average efficiency value of 0.97 during the 2019-2023 period. Even though it did not reach a perfect level of efficiency, Indonesian banking only experienced a slight decline, from 0.99 in 2019 to 0.96 in 2023. This shows that banking in Indonesia is quite stable in maintaining its operational efficiency.Banking in the United States demonstrated almost perfect efficiency, with an average efficiency of 0.99 over those five years. The efficiency level remained at 1% in 2019 and 2020, then decreased slightly to 0.98 in 2023. This indicates that banks in the US have very strong and relatively stable efficiency performance.

Meanwhile, banking in China also shows a positive trend in efficiency, with an average efficiency of 0.98. China achieved a perfect efficiency of 1% in 2021, despite slight fluctuations in other years. China's efficiency increased from 0.96 in 2019 to 0.98 in 2023, indicating an improvement in overall operational performance. Overall, banking in the United States recorded the most stable and high efficiency compared to Indonesia and China, while China showed a positive upward trend. Banking in Indonesia also shows good stability, although slightly below the efficiency level of the other two countries.

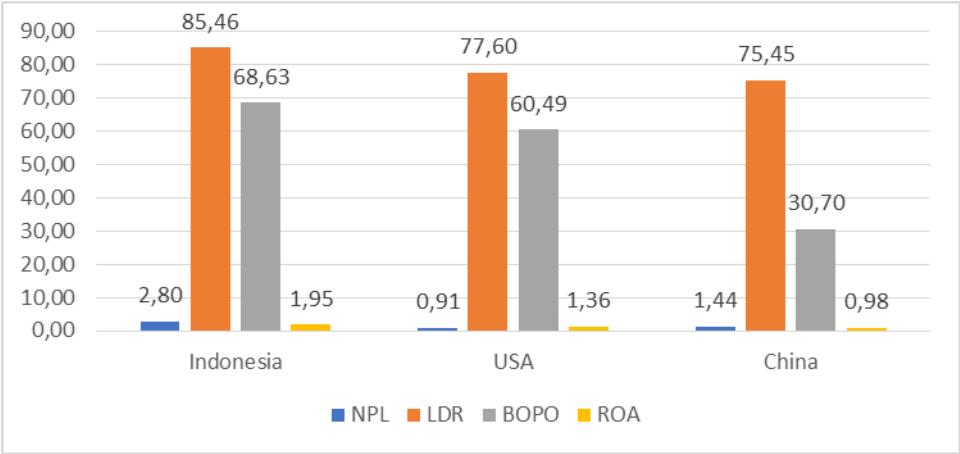

Fig. 4 Comparison of Indonesian, American, Chinese Banking Performance Indicator Ratio

Based on comparative banking performance data, it can be seen that the United States (USA) has the highest average efficiency over five years (2019–2023) with a value of 0.99, followed by China with 0.98 and Indonesia with 0.97. This higher efficiency reflects banking's ability to maximize output with minimal use of input. In addition, the USA has the lowest NPL (Non-Performing Loan) ratio of 0.91, indicating good credit risk management. In contrast, Indonesia has the highest NPL ratio at 2.80, which indicates there are more non-performing loans compared to the USA and China (1.44). This indicates that credit risk is higher in Indonesia. In terms of Loan to Deposit Ratio (LDR), Indonesia has the highest ratio of 85.46, which shows a more aggressive approach in lending compared to the USA (77.60) and China (75.45). High LDR can support profitability but also carries risks if not managed well. The BOPO ratio (Operating Costs to Operating Income), which shows operational efficiency, is lowest in China at 30.70, followed by the USA (60.49) and Indonesia (68.63). The lower BOPO level in China shows that banks in this country are more efficient in managing their operational costs compared to the USA and Indonesia. In terms of Return on Assets (ROA), Indonesia recorded the highest value of 1.95, followed by the USA (1.36) and China (0.98), indicating that banks in Indonesia are able to generate higher profits from the assets they own.

Data processing results also show that banks with high assets and profitability tend to have greater capacity to maintain good operational performance and efficiency. With a strong asset foundation, the bank has sufficient liquidity to face economic fluctuations and market risks, while supporting long-term growth. High profitability provides benefits for reinvestment in technology development, service improvement, and network expansion which in turn can increase operational efficiency. Excellence in these two aspects allows banks to manage costs effectively, increase productivity, and maintain competitiveness in an increasingly competitive market.

Based on the description of the data processing results, the level of banking efficiency in the United States, China and Indonesia shows stability and improvement which is relevant to several previous research findings. Ferara & Kounetas' (2021) study reveals that persistent efficiency has a major

influence in reducing production and cost inefficiencies, and most banks experience increasing economies of scale, regardless of size or ownership. This finding is in line with banking conditions in the USA, which maintained high and stable efficiency in the 2019–2023 period. Meanwhile, Antunes et al. (2022) show that banking efficiency in China experienced an increase in efficiency until it peaked in 2015 before declining, but in this latest data, it appears that China's banking efficiency is again experiencing a positive trend, reflecting improved operational management and the potential for effective economies of scale.

Apart from that, Haryanto's (2018) research which states that credit risk affects banking efficiency in Indonesia is in line with the finding of high NPLs in banks in Indonesia. The high NPL indicates that banks in Indonesia are still facing challenges in risk management, which has the potential to suppress their operational efficiency. Ari's (2021) research also supports these findings, where efficiency can be increased through reducing inputs such as labor costs and fixed assets, indicating that efficiency challenges in Indonesia can be overcome with stricter input management. Meanwhile, Jiang & He's (2018) study on the implementation of the macroprudential framework in China is relevant to the stability of efficiency shown in the data, reflecting the success of these policies in supporting stable growth and reducing financial risks in China's banking sector.

CONCLUSIONS AND RECOMMENDATIONS

Banking performance assessments often use efficiency indicators to assess the bank's intermediation function, namely the comparison between the inputs used and the output produced in its operations. Differences in how each bank utilizes input and optimizes output causes efficiency values to vary between these banks. Banks in Indonesia, the United States and China apply different policies in the use of resources and management of operational results, which ultimately affects their respective levels of efficiency. This policy is influenced by various factors, including government regulations, business strategies, and market conditions in each country.

Based on existing data, it appears that banking in the United States (USA) has the highest and most stable level of efficiency with an average of 0.99 during the 2019–2023 period. This is followed by China with an average efficiency of 0.98 which shows an increasing trend, and Indonesia with an average efficiency of 0.97 which is quite stable although slightly below the USA and China. The USA also has the lowest NPL ratio, indicating good credit risk management, while Indonesia has the highest NPL ratio, indicating challenges in managing credit risk. On the other hand, Indonesia has the highest LDR ratio, which indicates a more aggressive approach in lending. In terms of operational efficiency, Chinese banks show better performance with the lowest BOPO, followed by the USA and Indonesia. Beside that, Banks with high assets and profitability tend to be better able to maintain their performance and efficiency. Large assets provide stable liquidity, while high profitability allows reinvestment to improve services and operational efficiency, strengthening the bank's competitiveness.

Banking management in Indonesia, the USA and China needs to continue to evaluate and improve the efficiency of their performance. Banks in the USA which have been consistent in maintaining high efficiency are expected to be able to maintain this stability in the long term. Banks in Indonesia that face challenges in credit risk management need to increase control over NPLs and take a more careful approach in lending to balance profitability and risk. Meanwhile, banks in China are advised to continue to improve their already good operational cost efficiency, while still paying attention to improvements in technology and operational scale. Efforts to increase efficiency are important as a banking strategy to survive in an environment of intense competition and dynamic economic conditions.

FURTHER STUDY

This research is limited to banks in Indonesia, the USA and China. For further research, it can be further developed in terms of the number of banks and regions. Then, this research is limited to micro variables so that for future research it is possible to also see the influence of macro variables on banking performance efficiency.

REFERENCES

Afifah, F. D. N., Fitriani, F., & Aliya, H. (2022). Kebijakan Bank Sentral untuk Mengatasi Masalah Ekonomi pada Masa Pandemi Covid-19 di Indonesia. Journal of Economics and Social Sciences (JESS), 2(2), 80–88. https://doi.org/10.59525/jess.v2i2.303

Agustina, M., Majid, M. S. A., Faisal, F., & Musnadi, S. (2023). Does Islamic Banking Sector Matter for Income Disparity Reduction? Empirical Evidence from Indonesia. International Journal of Professional Business Review, 8(5), e01475. https://doi.org/10.26668/businessreview/2023.v8i5.1475

Antunes, J., Hadi-Vencheh, A., Jamshidi, A., Tan, Y., & Wanke, P. (2022). Bank efficiency estimation in China: DEA-RENNA approach. Annals of Operations Research, 315(2), 1373–1398. https://doi.org/10.1007/s10479-021-04111-2

Chen, K., Ren, J., & Zha, T. (2018). The Nexus of Monetary Policy and Shadow Banking in China. American Economic Review, 108(12), 3891–3936. https://doi.org/10.1257/aer.20170133

Christianti, A. (2021). EFFICIENT COMPARISON OF THE TOP 10 LARGEST COMMERCIAL BANKS IN INDONESIA: DEA (DATA ENVELOPMENT ANALYSIS). MIX: JURNAL ILMIAH MANAJEMEN, 11(3), 427. https://doi.org/10.22441/mix.2021.v11i3%9

Ding, N., Fung, H., & Jia, J. (2017). Comparison of Bank Profitability in China and the USA. China & World Economy, 25(1), 90–108. https://doi.org/10.1111/cwe.12188

Doan, A.-T., Lin, K.-L., & Doong, S.-C. (2018). What drives bank efficiency? The interaction of bank income diversification and ownership. International Review of Economics & Finance, 55, 203–219. https://doi.org/10.1016/j.iref.2017.07.019

Fan, X. (2016). Efficiency Research of Chinese Commercial Banks Based on Super-Efficiency DEA Method. American Journal of Industrial and Business Management, 06(04), 526–534. https://doi.org/10.4236/ajibm.2016.64048

Ferrara, G., & Kounetas, K. E. (2024). US banks efficiency after global financial crisis: Transient and persistent decomposition. North American Journal of Economics and Finance, 72(September 2022), 102115. https://doi.org/10.1016/j.najef.2024.102115

Ferreira-Silva, J., Oliveira, C. M., & Neto, J. S. (2024). Portuguese Banks Efficiency: A Data Envelopment Analysis. Procedia Computer Science, 237(2021), 277–288. https://doi.org/10.1016/j.procs.2024.05.106

Ghosh, A. (2018). Real sector consequences of bank diversification: evidence across US industries and states. Journal of Financial Economic Policy, 10(3), 322–341. https://doi.org/10.1108/JFEP-07-2017-0067

Grigorian, D. A., & Manole, V. (2006). Determinants of Commercial Bank Performance in Transition: An Application of Data Envelopment Analysis. Comparative Economic Studies, 48(3), 497–522. https://doi.org/10.1057/palgrave.ces.8100129

Hadad, M. D., Santoso, W., Ilyas, D., & Mardanugraha, E. (2003). Analisis efisiensi industri perbankan Indonesia: Penggunaan metode nonparametrik data envelopment analysis (DEA). Research Paper, 7(5), 1–28.

Hardiyanti, S. E., & Haryanto, Y. (2022). Analysis of Foreign Bank Presence Factor on the Factor of Economic growth Indonesia using Confirmatory Factor Analysis (CFA). Management Science Research Journal, 1(1), 44–51. https://doi.org/10.56548/msr.v1i1.7

Haryanto, S. (2018). Determinan Efisiensi Bank: Analisis Bank Di Indonesia. AFRE (Accounting and Financial Review), 1(1). https://doi.org/10.26905/afr.v1i1.2230

Ibrahim, M. A., Eprianti, N., & Yusup, A. (2020). Selection of Priority Needs for Employee Recruitment in Islamic Banking. Proceedings of the 2nd Social and Humaniora Research Symposium (SoRes 2019). https://doi.org/10.2991/assehr.k.200225.076

Ilyas, F. A., & Setyorini, C. T. (2023). The Assessment of State-Owned Bank Soundness Using RGEC Method Before and During Covid-19 Pandemic. JURNAL AKUNTANSI, 18(2), 96–110. https://doi.org/10.37058/jak.v18i2.7830

Jessica, C., Goh, T. S., & Elidawati, E. (2022). ANALYSIS OF BANKING EFFICIENCY USING THE DEA (DATA ENVELOPMENT ANALYSIS) METHOD AT MESTIKA BANK WHICH IS LISTED ON THE INDONESIA STOCK EXCHANGE. SIMAK, 20(02), 243–255. https://doi.org/10.35129/simak.v20i02.364

Jiang, H., & He, Y. (2018). Applying Data Envelopment Analysis in Measuring the Efficiency of Chinese Listed Banks in the Context of Macroprudential Framework. Mathematics, 6(10), 184. https://doi.org/10.3390/math6100184

Lee, C.-C., Li, X., Yu, C.-H., & Zhao, J. (2021). Does fintech innovation improve bank efficiency? Evidence from China's banking industry. International Review of Economics & Finance, 74, 468–483. https://doi.org/10.1016/j.iref.2021.03%9

LIAO, C. S. (2020). Evaluation and Comparison of Bank Efficiency in Cross-Strait after ECFA. The Journal of Asian Finance, Economics and Business, 7(10), 783–793. https://doi.org/10.13106/jafeb.2020.vol7.no10.783

Mekinjić, B. (2019). THE IMPACT OF INDUSTRY 4.0 ON THE TRANSFORMATION OF THE BANKING SECTOR. JOURNAL OF CONTEMPORARY ECONOMICS, 1(1). https://doi.org/10.7251/JOCE1901006M

Miller, J. W., & Muir, W. A. (2020). A New Perspective on Returns to Scale for Truckload Motor Carriers. Journal of Business Logistics, 41(3), 236–258. https://doi.org/10.1111/jbl.12234

Nayak, B. S., & Xu, J. (2018). Historical Trends and Transitions in Credit Risk Management of Chinese Commercial Banks. International Journal of Business Administration, 9(5), 96. https://doi.org/10.5430/ijba.v9n5p96

Onyeka Chrisanctus Ofodile, Olubusola Odeyemi, Chinwe Chinazo Okoye, Wihelmina Afua Addy, Adedoyin Tolulope Oyewole, Omotoya Bukola Adeoye, & Yinka James Ololade. (2024). DIGITAL BANKING REGULATIONS: A COMPARATIVE REVIEW BETWEEN NIGERIA AND THE USA. Finance & Accounting Research Journal, 6(3), 347–371. https://doi.org/10.51594/farj.v6i3.897

Pasha, T. (2023). The Effects of Selected Determinants on The Performance of Banks: Evidence from Developed Market Economies from 1984 to 2018. Qalaai Zanist Scientific Journal, 8(2). https://doi.org/10.25212/lfu.qzj.8.2.44

Radojicic, M., Savic, G., & Jeremic, V. (2018). MEASURING THE EFFICIENCY OF BANKS: THE BOOTSTRAPPED I-DISTANCE GAR DEA APPROACH. Technological and Economic Development of Economy, 24(4), 1581–1605. https://doi.org/10.3846/tede.2018.3699

Rusydiana, A. S. (2016). ANALISIS PROBLEM PENGEMBANGAN PERBANKAN SYARIAH DI INDONESIA: APLIKASI METODE ANALYTIC NETWORK PROCESS. ESENSI, 6(2). https://doi.org/10.15408/ess.v6i2.3573

Samad, A. (2019). Determinants of Commercial Bank Efficiency? Evidence from Bangladesh. Journal of Business Diversity, 19(3). https://doi.org/10.33423/jbd.v19i3.2218

Sari, S., Ajija, S. R., Wasiaturrahma, W., & Ahmad, R. A. R. (2022). The Efficiency of Indonesian Commercial Banks: Does the Banking Industry Competition Matter? Sustainability, 14(17), 10995. https://doi.org/10.3390/su141710995

Sasea, E. M., & Sakmaf, M. S. (2023). DIGITAL BANK LEGAL CHALLENGES: SECURITY PROTECTION AND LEAKAGE OF CUSTOMER PERSONAL DATA. Awang Long Law Review, 6(1), 245–250. https://doi.org/10.56301/awl.v6i1.989

Siregar, K. H., Qarib, A., & Ruslan, D. (2019). Analysis of Islamic Banking Market Structure in Indonesia with Panzar-Rosse Model Approach.

Budapest International Research and Critics Institute (BIRCI-Journal) : Humanities and Social Sciences, 2(2), 122–133. https://doi.org/10.33258/birci.v2i2.243

Wang, H., Wang, Y., Zhao, S., Wang, L., & An, H. (2018). The transnational comparative study on the potential risks and efficiency of commercial banks based on the weight-limited DEA model. China Finance Review International, 8(4), 441–452. https://doi.org/10.1108/CFRI-06-2017-0126

Zafrizal, M., Yakob, R., & Low, S. W. (2021). The influence of liquidity risk on efficiency in rural banks: the moderating role of interbank borrowing fund. Asian Academy of Management Journal of Accounting and Finance, 17(2), 63–79. https://doi.org/10.21315/aamjaf2021.17.2.3