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Determinants of Efficiency: Asset Diversification, Risk, Bank Size, and Liquidity

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Abstract

Banking plays an important role in the economy both micro and macro. In addition, it is crucial for a country to have a strong and robust banking system. To realize a strong and robust banking banks need to maintain their efficiency. Therefore, it is necessary to identify the factors that affect efficiency, including asset diversification, risk, bank size and bank liquidity. The sample of this research are conventional banks with a total of 10 banks that have the largest share of assets in Indonesia. In this study to identify the effect of asset diversification, bank risk, bank size, and bank liquidity on bank efficiency used multiple linear regression analysis methods were used. This study concludes that asset diversification actually reduces bank efficiency. The increased bank risk, the better efficiency. Then, the size of the bank and liquidity have no effect on efficiency. Therefore, banks need to review the diversification strategy, ensure that the risks associated with each asset and portfolio as a whole are well-identified and look for opportunities to automate repetitive processes and reduce overall operational costs.

Keywords : Asset diversification; Bank size; Efficiency; Liquidity; Risk.
JEL Classification : G20, G21, G29

1. Introduction

Stock Banking plays an important role in the economy both micro and macro. In addition, it is crucial for a country to have a strong and robust banking system, especially developing countries such as Indonesia to achieve economic growth. To realize a strong and robust banking system, banks need to maintain their efficiency. An efficient banking system can be used as a tool for mobilization and allocation of funds to encourage investment and savings to be more effective and provide low-cost monetary payments (Nguyen, 2018).

Banking is also inseparable from intense competition so that business is required to be efficient in order to survive and develop in the midst of competition. With a higher level of efficiency, banks can increase their investment and contribute to the advancement of the economy. Conversely, if banking efficiency is low, the bank will cause the economy to grow slowly which ultimately reduces social welfare (Fathony, 2013).

One of the factors affecting banking efficiency is asset diversification. Asset diversification is the diversity of financial services offered by banks. As banks offer more and more financial services, the more they need to run their operations efficiently. Research on diversification has been widely conducted, but there is still much debate about the effect of diversification on efficiency which is one measure of banking performance. Some researchers argue that diversification has a positive impact on performance (Elsas et al., 2010).

Risk also affects efficiency. Banking one of its main activities is lending. This causes banks to be inseparable from credit risk. The greater the credit allocated to the community, the greater the risk that will be borne by the bank and have an impact on decreasing profits. It can be said that credit risk is one of the determinants of bank performance (Funso et al., 2012). Banks have risks due to the inability of customers to pay credit interest and increase the principal and ultimately result in a decrease in the level of bank efficiency. The Basel Committee on Banking Supervision suggests that credit risk is likely to lose outstanding loans partially or completely, due to failure to manage credit. Research on credit risk on efficiency was examined by Sparta (2016) and Marqués-Ibáñez et al (2010) which suggests that the higher the level of bank risk, the lower the level of bank efficiency.

Efficiency is also affected by the size of the bank. The greater the assets owned, the more capable the bank is in meeting its operational needs such as for credit, guarantees, currency trading, product services and services. In addition, the larger the size of the bank, the more complex bank services will encourage banks to make efficiency in their operational activities. However, the size of the bank can also have a negative impact, namely increasing operational costs so that it affects the amount of costs that must be paid by the bank and in turn can reduce the level of bank efficiency. Several studies on the effect of bank size on bank efficiency have been conducted, including research by Doaei et al., (2015). In contrast, research conducted by Nigmonov, (2010) proves that the size of the bank does not affect efficiency.

The last factor in this study that can affect efficiency is bank liquidity. Liquidity relates to the extent to which banks can provide credit and withdraw customer funds. (Fitri & Marlius, 2019) suggest that banks are required to be able to maintain their health, especially in maintaining liquidity. Liquidity risk can occur if the amount of funds disbursed in the form of financing is greater than deposits or public deposits collected by banks. Several researchers have conducted research on the relationship between liquidity and bank efficiency, including Azizah (2018); Candra & Yulianto (2015); Wahab (2015). The results of the research prove that liquidity has a positive effect on bank efficiency. Based on this exposure, the researcher analyzed the effect of asset diversification, risk, bank size and bank liquidity on banking efficiency.

2. Hypotheses Development

Banking Efficiency

Bank efficiency can play an important role in shaping the real economy and helping an inadequate economy progress. A country's entire economy can be threatened due to a weak and incompetent banking system (Nassir Shaari et al., 2011). Efficiency is defined as "maximum use of existing resources in an improved and more productive way." Based on this definition, it can be said that efficient companies show higher performance with minimal input. Efficiency is defined as "more output per unit of input indicates higher efficiency." The idea of measuring efficiency determines how a firm can maximize output and profits while minimizing costs (Othman et al., 2016).

Efficiency measurement allows managers to compare bank performance and explore areas of inefficiencies for future improvement (Othman et al., 2016). Commercial banks' internal rating system using critical financial performance to support competitiveness and profitability in the long run (Belas et al., 2012). In addition, bank efficiency brings customer satisfaction and more customers, which can translate into more profitability. However, Belas et al., (2014) found that the factors affecting bank customer satisfaction are almost the same in different countries.

Research on bank efficiency in developing countries has grown rapidly, but there has been little research on the case of Indonesia (Margono et al., 2010; Hadad et al., 2011; Zhang & Matthews, 2012; Defung et al., 2016). In Indonesia, as is common in many countries; large banks tend to advance in diversifying their products, technology, and number of branches which outweigh the negative effects. This is supported by several studies. Larger banks can be more efficient than smaller banks, confirming other studies such as (Hadad et al., 2011; Zhang & Matthews, 2012) but contradicting with Jha et al., (2013).

Asset Diversification

Diversification is a strategy carried out with the aim of improving banking performance. One way that can be done is by expanding the business, opening several new business units or subsidiaries

both within the scope of the company and different from the company's core business. Asset diversification is the diversity of financial services offered by banks. The more financial services offered by banks, the more banks are required to carry out their business activities efficiently. Research on diversification has been widely conducted, but there is still much debate about the effect of diversification on company performance. Some researchers have concluded that diversification has a positive impact on performance (Elsas et al., 2010). In Indonesia itself, there have also been many studies that measure efficiency, but studies on diversification and efficiency in banking are still not widely conducted.

The Effect of Asset Diversification on Banking Efficiency

Nguyen, (2018), explained asset diversification as a strategy to reduce risk and as an effort to increase efficiency. Hackethal & Holzhauser, (2010) also mention that diversified banks will acquire the skills to make efficient business decisions. This is supported by Curi et al., (2015) which measures Efficiency with three dimensions of bank diversification, namely, asset diversification, funding, and income. They found that asset diversification can improve bank efficiency, while income and funding diversification negatively affect efficiency.

The results of research from Anggraeni & Saputri, (2020) showed that asset diversification, bank risk, and bank liquidity had a negative effect on efficiency caused by the inability of banks to carry out asset strategies appropriately. Accuracy in carrying out strategies will actually have an impact on decreasing the level of efficiency of Islamic banks. This finding is consistent with Curi et al., (2015) that for the four largest banks, asset and funding diversification impair cost efficiency.

Nguyen, (2018) suggests that diversified funding banks with majority ownership of the government show higher cost efficiency but lower profit efficiency than other banks. Based on these previous studies, asset diversification affects bank efficiency. However, research by Curi et al., (2015) found that asset diversification improved bank efficiency only during the consolidation period, whereas during the global financial crisis of 2007–2008, income and funding diversification had greater negative impacts on bank efficiency.
H_1: asset diversification affects bank efficiency.

The Effect of Default Risk on Banking Efficiency

According to Chen and Pan (2012) credit risk is the degree of value fluctuations in debt instruments and derivatives due to changes in the credit quality underlying the loan and counterparties. Credit risk is often referred to as default risk which is defined as the risk faced due to the inability of customers to pay credit interest and repay the principal. In the end, it will have an impact on reducing the level of bank efficiency. (Assaf et al., 2019) show the results that if managers can lower costs during normal times, the consequences of high bank efficiency during financial crises can help reduce bank risk and lower the likelihood of bank failure. Meanwhile, (Sparta, 2016) has research results that the higher the level of bank risk, the lower the level of bank efficiency (Fiordelisi et al., 2011) which explains the relationship of credit risk negatively affects bank efficiency.

Fiordelisi et al., (2011) also state that the relationship between credit risk and bank efficiency can be explained by the "Bad Luck" Hypothesis. The relationship between non-performing loans and bank efficiency can be explained by the bad luck hypothesis put forward by Berger and DeYoung in 1997. Berger and DeYoung suggest that the unexpected outcome of a "bad luck" could cause banks to face troubled loans. Banks may face more operational costs, and this can disrupt the bank's efficiency. Costs arise from monitoring borrowers, collateral value, or disposal costs associated with defaulted loans. Therefore, the bad luck hypothesis postulates that the higher the increase in non-performing loans, the more likely it is that bank efficiency will decrease.
H_2: Bank risk affects bank efficiency.

The Effect of Size on Banking Efficiency

The size of the bank can have an impact on increasing operational costs so that it affects the amount of costs that must be paid by the bank. In the end, the amount of operational costs can reduce the level of bank efficiency (Anggraeni & Saputri, 2020). Firm size has a negative relationship with knowledge production efficiency and mature stage clusters have a negative relationship with

knowledge commercialization efficiency and overall efficiency with the DEA Model. Based on these studies, the size of the bank affects the efficiency of the bank.
H_3: The size of the bank negatively affects the efficiency of the bank.

The Effect of Liquidity on Banking Efficiency

Liquidity is the ability of a bank to meet its fund needs related to credit requests and all withdrawals of customer funds collected at any time. In terms of financial concepts, liquidity can be seen as a financial concept which means the amount of money that must be available for investment (Acharya et al., 2017). This money is more likely to be credit than cash in current investments(Bolek & Wolski, 2012). When interest rates are low, liquidity will be high which means a lot of capital to be spent. can be easily available (Allen, 2017). Liquidity can be interpreted as a condition to determine its ability to meet its increasing obligations consisting of long-term debt and current liabilities (Guerrieri & Lorenzoni, 2017). In measuring cash assets or other relative amounts of assets that can be easily converted into cash without losing value to cover short-term liabilities can also be seen as liquidity (Chen & Lu, 2019; Lagos et al., 2017). Liquid assets consist of cash and balances of banks, debtors and securities (Fong et al., 2017).

Liquidity can help companies to avoid certain situations such as selling assets at distressed prices to force them to grant liquidation, paying additional fees to lawyers and bankruptcy as well which means more liquidity increases the likelihood of bankruptcy being reduced (Castiglionesi et al., 2019; Schwarz, 2019). As a result, the time to convert assets into cash and the level of certainty associated with this conversion can be seen as two important dimensions of liquidity.

The inability of banks to provide funds will lead to liquidity risk. Risk occurs if the amount of funds disbursed in the form of financing is greater than deposits or public deposits collected by banks. This incident can pose risks that must be borne by banks (Rahmi, 2014). Several researchers have conducted research on the relationship between liquidity and bank efficiency, including (Azizah, 2018; Candra & Yulianto, 2015; Wahab, 2015) prove that the known liquidity of FDR has a positive effect on the efficiency of the bank concerned. Therefore, the hypothesis is that liquidity has a positive effect on bank efficiency.
H_4: bank liquidity has a positive effect on bank efficiency.

3. Method, Data, and Analysis

Sample Clarification

The population in this study is conventional banks that have been registered with the Financial Services Authority (OJK) for the quarterly period per December from 2013 to 2022. Sampling in the study was carried out using the Purposive Sampling method. Samples are selected based on predetermined sample criteria, including Conventional banks with a total of 10 banks that have annual financial statements as of December from 2013 to 2022 and have complete data during the observation period. Next, the ten conventional banks selected are banks that have the largest share of assets in Indonesia. The list of banks is as follows.

Table 1. Research Sample

No.	Bank-Bank
1.	Bank Bank Nasional Indonesia
2.	Bank Central Indonesia
3.	Bank Rakyat Indonesia
4.	Bank Mandiri
5.	Bank Tabungan Negara
6.	CIMB Niaga
7.	UOB Indonesia
8.	Citi Bank
9.	DBS Indonesia
10.	Permata

Data collection

This research uses secondary data, namely data obtained through annual financial statements that have been provided by banks on the Financial Services Authority (OJK) website. The approach

used is an intermediary approach because it considers the vital function of the bank itself, namely as financial intermediation.

Operational Definition

Banking Efficiency

Operating Cost in Operating Income (BOPO) is a ratio of comparison between operating costs and operating income in measuring the level of efficiency and the ability of banks to carry out their operations (Zainal, 2013: 482). BOPO is measured quantitatively using efficiency ratios. Operating Costs in Operating Income (BOPO) are costs incurred by banks in order to carry out their basic business activities (such as interest costs, labor costs, marketing costs and operating costs other). This ratio can be formulated as follows:

BOPO: Operating Expenses/Operating Income

Asset Diversification

The equation related to asset diversification used in this study refers to Nguyen, (2018) which can be explained in the following equation:
Where, ADIV: Asset Diversification; CLOAN: Financing to customers; IBLOAN: Placement in another bank; SEC: Placement in securities; OTHEREA: Placement in other productive assets;EA: is the sum of all four numerators.

Bank Risk

The higher the NPL ratio indicates the greater the uncollectible financing. This will also increase bank monitoring costs and have an impact on lowering bank revenue levels, thereby reducing bank efficiency levels. This failure will also have a significant impact on bank operations, increase costs, so as to reduce profits and bank performance or efficiency (BIS, 2011).

NPL = Non-performing Loans/Total Financing

Bank Size = Total Asset

The larger the size of the bank, the more complex the service and the more sophisticated so that costs can be reduced and efficiency increases. But on the other hand, the size of the bank can also have an impact on increasing operational costs so that it affects the amount of costs that must be paid by the bank. In the end, the high cost of this can reduce the level of efficiency.

Liquidity

Bank Indonesia Circular Letter No. 17/44/DPM dated 16th December 2015 formulates FDR's function as equation 7 as follows:
FDR = Financing/Third Party Funds

The greater the financing distributed to customers, the more the bank's profit-sharing income increases. This increase in bank revenue also has an impact on the level of bank efficiency.

Data Analysis Techniques

In this study to identify the effect of asset diversification, bank risk, bank size, and bank liquidity on bank efficiency used multiple linear regression analysis methods were used. Here's the model in equation.

$$Y_{it} = a + b_1X_{1it} + b_2X_{2it} + b_3X_{3it} + b_4X_{4it} + e_{it}$$

Information: X_1: asset diversification; X_2: bank risk; X_3: bank size; X_4: bank liquidity

To achieve the objective of this study, two variables were used which were RV calculated as the natural log of today's closing price divided by yesterday's price and VOL which was the daily trading volumes for the JSE (Johannesburg Stock Exchange), the Borsa Istanbul 100 (BIST 100), CAC-40 (the French Stock Market Index), the DAX (the German blue chip companies) and the Nasdaq Index. All the

required data was retrieved from yahoo finance which provides credible and real time data sets. The sample period was the most recent 5 years (March 5, 2018 to March 5, 2023). The data analysis process was in four stages, firstly a descriptive statistic was first conducted to glean the stylist facts of RV and VOL followed by a unit root test. This unit root test was conducted to ensure that RV and VOL were stationary. RV and VOL are said to be stationary if their statistical properties such as the mean, variance and covariance are constant overtime or no trends exist (Nkoro & Uko, 2016). As described in prior literature (Holder, Leon & Wood, 1990), a stationary test is important because non-stationary variables produce spurious results. Accordingly, an Augmented Dickey Fuller (ADF) test was applied to determine the stationarity status of the variables. Where the p-values were less than 5%, RV and VOL were confirmed to be stationary and vice versa. According to Tam, (2013) an ADF test is given by:

$$\Delta y_t = \alpha + \delta y_{t-1} + \sum_{i=1}^{n} \beta_i \Delta y_{t-1} + \varepsilon_t$$

$$y_t = \alpha + \text{б} y_{t-1} + \varepsilon_t$$

H_0: Stationary variable if the P-value is less than 5%.
H_1: Non- Stationary variables if the P-values is more than 5%.

A granger causality test was conducted to examine whether the information provided by the lag values of RV allows for a more accurate prediction of VOL and vice versa. In other words, a Granger causality test was used to provide evidence of correlation between RV and VOL. If RV Granger causes VOL, then RV can be used to predict future values of VOL and vice versa (Enow, 2023). Albeit, inference must be done cautiously taking into consideration that Granger causality is used for short run relationships. Mathematically, a granger model is given by:

$$RV_t = a_0 + a_1 RV_{t-1} + a_2 VOL_{t-1} + \epsilon$$

Where, a_0 is the coefficient of the intercept and ϵ is the error term (Song & Taamouti, 2019).
H_0: No Causality effect between RV and VOL because the p-value is more than 5%.
H_1: Granger Causality effect between RV and VOL because the p-value is less than 5%.

Finally, a MSE and MAE model was utilized to provide a forecasted proportion between RV and VOL. These models provide the absolute and average magnitude error generated by a regression model (Chiang, Qiao & Wong (2009). The MSE and MAE also highlights the square differences between the observed and predicted values of RV and VOL, hence a notable advancement from the studies cited in the prior literature (Chiang, Qiao & Wong, 2009). The equations below represent the mathematical expression of MSE and MAE:

$$MSE = \frac{1}{N}\sum_{i=1}^{n}(RV - VOL)^2$$

$$MAE = \frac{1}{N}\sum_{i=1}^{n}|RV - VOL|$$

Adapted from Chiang, Qiao & Wong, (2009). The section below presents the results and analysis.

4. Results

The model fit test is used to select the best model in the research. To determine the best regression model using the Chow test, Hausman test,

Table 2. Test Chow

Effects Test	Statistic	d.f.	Prob.
Cross-section F	2.268244	(9,86)	0.0248
Cross-section Chi-square	21.299167	9	0.0114

The results of the Chow test show that the Prob Cross-section value is less than alpha (α: 0.05). Thus the best model used is the Fixed Effect Model compared to the Common Effect Model. The result of the Hausman Test can bee seen on table

Table 3. Hausman Test
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	4	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.
** WARNING: robust standard errors may not be consistent with assumptions of Hausman test variance calculation.

Hausman test shows that the Probability value of chi-square is 1 more than alpha (α: 0.05), Namun, terdapat keterangan bahwa robust standard errors may not be consistent with assumptions of Hausman test variance calculation. Therefore, the best model remains the fixed effect model. The Lagrange test does not need to be done because from the Chow test and the Hausman test a fixed effect model was selected.

Table 4. Linear Regression Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constanta	0.849529	0.104614	8.120574	0.0000
Diversifikasi Aset	-0.151102	0.026692	-5.660937	0.0000
Risiko (NPL)	3.055068	1.329928	2.297168	0.0240
Ukuran Bank	-2.64E-08	3.99E-08	-0.661004	0.5104
Likuiditas (FDR)	0.099128	0.114154	0.868374	0.3876
R square	0,639538			
Prob Fstatistic	0,000000			

Based on the results of the t-test, the value of the three variables, namely asset diversification and risk, has a probability value of less than 0.05, so it can be concluded that asset diversification has a significant effect on bank efficiency and has a negative relationship with bank efficiency. Bank risk has a significant positive effect on efficiency. The variable size of the bank and the liquidity of the bank have no effect on efficiency. For the F test, significant means that the entire independent variable has an effect on the dependent. The R-square value is also relatively high, at 63%. This means that all independent variables are able to explain the dependent by 63% and the rest are explained by other variables.

Asset diversification has a significant negative effect on efficiency with an alpha of 0.0240. That is, asset diversification is carried out precisely reducing bank efficiency. This can be caused by 3 things. First, the inability of banks to carry out asset strategies appropriately so that bank efficiency decreases. Second, differences in interests between managers and shareholders make diversification strategies inefficient. Third, the more diversified the company, the more difficult it will be to control so that information asymmetry increases, causing inefficiencies. The results of this study are in line with (Anggraeni & Saputri, 2020; Curi et al., 2015; Doaei et al., 2015). (Nguyen, 2018) states that diversifiedfunding banks with majority government ownership show higher cost efficiency but lower profit efficiency than other banks. Based on these previous studies, asset diversification affects bank efficiency.

Bank risk has a significant positive effect on efficiency. This is due to several things. First, the increasing bank risk then the bank will be more prudent so that efficiency can increase and the risk ethics increase the bank will develop strategies so that efficiency can increase. Second, high risk often leads to increased awareness of available resources. Banks become more wary of unnecessary spending and tend to optimize the use of resources so as to achieve efficient results. Third, banks that trade and invest have a high level of risk but high return and banks are able to manage risk to achieve profitable results, so the return on risk can have a positive impact on the overall efficiency of the bank. Fourth, banks that dare to take risks in adopting new technologies and innovating in services can achieve efficiency in the long run. Innovation can result in cost savings and improved operational efficiency.

Finally, banks that choose to take large risks but have the ability to manage risk through portfolio diversification can increase bank efficiency. Previous research that also supports the results of this study that bank risk has a positive effect on efficiency is the research of (Amer, 2011; Eldomiaty et al., 2015).

In this study, the size of the bank was not significant to efficiency. This can be caused by several things. First, certain banks may have a limited business focus on a particular service or product, so their size becomes relatively insignificant in achieving efficiency in its business scope. Second, small or medium-sized banks have not achieved optimal scale in operations and have not been able to provide cost-competitive services whereas, larger banks have the opportunity to face challenges in managing the scale of their operations. Third, the size of the bank does not have to be large, this is because advances in technology have allowed small banks to adopt technology systems and infrastructure that are just as efficient as large banks. This can help small banks compete effectively without having to have a large size. Finally, the efficiency of a bank is not only determined by its size, but management's ability to manage resources well and optimize operations. Several studies that support this research with the results that bank size does not affect cost efficiency within the study period. Yet another group of studies suggests that bank size has no impact on cost efficiency (Adjei-Frimpong et al., 2014; Fernando & Nimal, 2014).

In this study, liquidity had no effect on bank efficiency. This is because bank efficiency has more to do with how banks manage their operations, reduce overhead costs, increase productivity, and improve service quality than how liquid the bank is. In addition, actual efficiency is more influenced by how the bank manages these resources and optimizes operational costs whereas liquidity is considered part of the bank's business strategy is not the main determinant of the efficiency of a bank. It can be said, liquidity does not affect bank efficiency, where efficiency is classified as financial performance. The results of this study are supported by (Achmady et al., 2021; Iskandar & Zulhilmi, 2021) that liquidity has no effect on financial performance. Efficiency is included in one component of financial performance. This statement is supported by Hasibuan (2023) that financial performance is the ability to manage finances effectively, efficiently, and be able to achieve goals that can be seen from financial reports as information about financial conditions.

5. Discussion

The results of this study indicate that asset diversification negatively impacts bank efficiency, suggesting that the more diversified a bank's assets, the lower its efficiency. This can be attributed to several factors: ineffective implementation of diversification strategies, conflicts of interest between managers and shareholders, and information asymmetry. When banks fail to manage diversified asset portfolios efficiently, operational costs can rise, leading to reduced efficiency. This aligns with the findings of Anggraeni & Saputri (2020) and Curi et al. (2015), who also observed that diversification could diminish bank efficiency.

Conversely, the study found that risk positively affects bank efficiency, implying that an increase in risk can enhance efficiency. This can be explained by the increased vigilance in resource management, the development of robust risk management strategies, and the benefits of taking measured risks. Banks facing higher risks tend to optimize resource use, develop effective risk management strategies, and innovate, all of which contribute to improved efficiency. This is supported by research from Assaf et al. (2019) and Sparta (2016), who noted that well-managed risk could enhance efficiency.

Regarding bank size, the study found no significant impact on efficiency, suggesting that the size of a bank's assets does not directly influence operational efficiency. This could be due to the balance between economies of scale and increased complexity in management. Larger banks may benefit from reduced costs due to scale but face higher complexity, which can offset these benefits. This finding is consistent with Nigmonov (2010), who also observed no significant effect of bank size on efficiency.

Finally, the study determined that liquidity does not significantly impact bank efficiency. This indicates that a bank's ability to meet customer credit demands and withdrawals does not directly affect its efficiency. Stable liquidity management systems and the ability to adapt to fluctuating market conditions may explain this finding. Previous studies by Azizah (2018) and Wahab (2015) also show varied results, suggesting that the relationship between liquidity and efficiency is influenced by multiple factors.

This study offers insights into the factors affecting the efficiency of conventional banks in Indonesia. The findings suggest that while asset diversification tends to reduce efficiency, well-managed risk can enhance it. Bank size and liquidity do not significantly impact efficiency. Therefore, banks should carefully evaluate their diversification strategies and ensure effective risk management to achieve better operational efficiency.

6. Conclusion, Limitations, and Suggestions

Conclusion

This study concludes that asset diversification actually reduces bank efficiency, while increased bank risk improves efficiency. It also finds that the size of the bank and liquidity have no effect on efficiency. Based on these results, several suggestions can be made for various stakeholders, particularly the banks studied, regarding diversification and risk management, banks need to review their current diversification strategies. Some areas or types of assets may not align with the bank's risk profile and objectives. Banks should ensure that the risks associated with each asset and the overall portfolio are well-identified, measured, and managed. Banks should seek opportunities to automate repetitive processes and reduce overall operational costs.

Furthermore, this study explores the influence of asset diversification, risk, size, and liquidity on the efficiency of conventional banks in Indonesia. The findings reveal that asset diversification negatively impacts bank efficiency, likely due to increased operational complexities and potential conflicts of interest. In contrast, a higher level of risk positively influences efficiency, suggesting that well-managed risk can lead to better resource utilization and operational effectiveness. Interestingly, the study finds no significant impact of bank size and liquidity on efficiency, indicating that these factors do not directly affect how efficiently banks operate.

These insights emphasize the importance of strategic management in asset diversification and risk management to enhance bank efficiency. Banks should focus on optimizing their diversification strategies and implementing robust risk management practices to improve operational performance. Overall, this research contributes to a deeper understanding of the dynamics influencing bank efficiency, offering valuable implications for policymakers and bank managers aiming to enhance the operational efficiency of conventional banks in Indonesia.

Limitations and suggestions

This study has several limitations that warrant acknowledgment. Firstly, the analysis is constrained by the focus on only four variables: asset diversification, bank risk, bank size, and liquidity. Future research could benefit from expanding the range of variables studied to provide a more comprehensive understanding of bank efficiency. For instance, incorporating measures like maxdea and stochastic frontier analysis could offer alternative perspectives on efficiency assessment beyond the BOPO proxy used in this study.

Secondly, the study is limited to conventional banks in Indonesia, which may restrict the generalizability of the findings to other banking systems or regions. To enhance the applicability of the results, future studies could include different types of banks, such as Islamic banks, and examine banks in diverse geographical contexts.

Thirdly, reliance on secondary data in this study may have overlooked important factors affecting efficiency, such as specific managerial practices or technological advancements. To address this limitation, future research could incorporate primary data collection methods such as surveys or interviews to gain deeper insights into these critical aspects.

Moreover, the study's timeframe is relatively limited, which may not capture long-term trends and effects. Extending the study period could provide a more comprehensive view of the dynamics influencing bank efficiency over time.

Lastly, while this study focuses on key factors like asset diversification, risk, size, and liquidity, other contextual factors such as regulatory changes, economic conditions, and market competition could

also significantly impact bank efficiency. Future research should consider exploring these additional factors to enrich the understanding of efficiency determinants in the banking sector.

By addressing these limitations in future studies, researchers can build on the findings of this study and offer more robust recommendations for enhancing bank efficiency across various banking environments.

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