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THE IMPACT OF DIVERSIFICATION AND OWNERSHIP STRUCTURE ON EFFICIENCY: EVIDENCE FROM INDONESIA

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ABSTRACT

This study aims to examine the effect of asset diversification and income diversification on bank efficiency in Indonesia. In addition, it also examines the effect of the interaction between ownership structure and independent commissioners on diversification on efficiency. The study used a sample of seventy-eight banks in Indonesia from 2010 - 2018. By using the Stochastic Frontier Analysis, the average bank efficiency is around 86 percent. The paper applies panel data methodology. The results show that: From model 1, finding a strong evidence that asset diversification and income diversification are positive and significant to the efficiency. Control variables are also significant and as expected. From model 2 shows that asset diversification is positive and significant, income diversification is positive but not significant. The government ownership structure strengthens the relationship between asset diversification and efficiency, but not income diversification. Meanwhile, independent commissioners strengthen the relationship between asset diversification and income

diversification on efficiency. However, the results were not significant in terms of both ownership structure and independent commissioners in moderating the relationship between asset diversification and income diversification on bank efficiency. For control variable, size is positive and significant and for the risk bank, the result is negative and significant.

JEL Classification

D61, G21, G24, G33, L25

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INTRODUCTION

Monetary activities and the mobilization and allocation of funds effectively are driven by an efficient banking system and will ultimately encourage investment and savings (Nguyen, 2018). Bankruptcy banks generally start with a low level of efficiency (Berger et al., 1997). The findings of Apriyana et al. (2016) concluded that banks in Indonesia have not operated efficiently compared to banks in ASEAN so that this condition will affect the competitiveness of Indonesian banks in the ASEAN region. Referring to the empirical data and urgency conditions above, it is necessary to conduct a study on the diversification and efficiency of commercial banks in Indonesia. Bank efficiency is faced with a condition to obtain an optimal level of output with existing input levels, or to obtain a minimum input with a certain level of output (Hadad et al. 2003). Efficiency also plays an important role in banking stability because a bank with a higher risk will result in inefficient bank performance (Spulbär et al. 2015).

Efficiency is regarded as the main hinder for bank to compete in the market. One of the efforts to achieve efficiency is diversification. Diversification is the act of making things more diverse with the aim of not being fixated on just one product. Previous research has questioned whether banks should diversify in various products, assets and sources of funding (Berger et al. 1995). Research shows that diversification is able to help banks gain economic scope by spreading fixed costs for different products so that management is able to lead banks to a variety of products and different markets (Leaven, 2007) and diversification can reduce the bankruptcy of Berger et al. (2010). Thus, it will obtain more efficient business decisions in the future. Elsas et al. (2010).

Nguyen (2018) found at the effect of diversification on bank performance by taking into account the ownership structure with varying results. Meslier et al. (2014) in a study in the Philippines from 1999 to 2005 found that banks with foreign ownership strengthen the effect of income diversification on profitability. A study conducted by Fries & Taci (2005) found that banks with foreign ownership have a significant positive relationship with the level of cost efficiency. Nguyen's study (2015) found that banks with government ownership strengthen the effect of funding diversification on bank efficiency. Berger et al. (2010) found that banks with government ownership strengthen the effect of asset diversification on efficiency.

The role of Good Corporate Governance is able to prevent or the level of earnings management by the company (Fanani, 2012). Agency theory

considers that independent commissioners are needed on the board of commissioners to supervise and control the actions of directors, in relation to their opportunistic behavior (Jensen and Meckling, 1976). Herawati (2008) research results prove that corporate governance has a significant effect on firm value with the independent commissioner variable and institutional ownership. Independent commissioner, audit quality and institutional ownership are moderating variables between earnings management and firm value, while managerial ownership is not a moderating variable. Nurkhin et al (2018) found that Corporate Governance of Sharia Bank in Indonesia has a significant and positive influence on the financing ratio but has no influence on the non halal income ratio.

From the previous studies, there is no consistency in the determinant of the efficiency. This research is to examine two dimensions of bank diversification, there are: asset diversification, income diversification. The second issue in this research is to measure banking efficiency. In this case, the measurement of efficiency will use an efficiency approach with a parametric method, namely by using the Stochastic Frontier Analysis (SFA) method to obtain the efficiency score of the banking industry in Indonesia. This study will also look at other variables that control the relationship between diversification and efficiency. For this reason, this study also examines the control variables used: Bank size (total assets) and credit risk. We expect this study will provide a strong empirical evidence on the importance of diversification for conventional banking firms operating in Indonesia.

LITERATURE REVIEW

Efficiency is the ability of an organization to produce maximum output by using certain inputs or using minimum inputs with a certain level of output. Efficiency in the banking industry is one of the important indicators in company performance. Various developments and events that occurred in the banking industry led to the importance of emphasizing efficiency. The study conducted by Spong et al. (1995) show that increasing competition in the financial industry, technological innovation and consolidation have led to costs and efficient provision of bank services and products. Thus efficiency shows the ability of the organization to use resources properly and there is no waste. Every company will try to achieve the optimal level of performance possible. Banks are said to achieve efficiency on a scale when they achieve operational capability on a constant return to scale.

Measuring the level of bank efficiency can be done with various approaches. The approach used includes a traditional approach using financial ratios, a mathematical approach (non-parametric) and an econometric approach (a parametric approach). A study that has conducted efficiency measurements using SFA for the first time was conducted by Aigner et al. (1997), followed by studies of efficiency measurement using other SFAs, such as those conducted by Berger & Hannan (1997) and Berger & Mester (1997) and Ivan (2015).

Zaini Abd Karim et al. (2015) and Tahir et al. (2012). Karim (2015) found that the large banks in the Southeast Asia region had a tendency to have a greater

level of efficiency compared to smaller banks. While the results of the study from Tahir et al. (2014) found that banks in Malaysia have lower cost efficiency compared to other countries in the Southeast Asia region. A study on banking efficiency in the ASEAN-5 region has also been conducted by Apriyana et al. (2016) found a conclusion that generally banks in the ASEAN-5 region operate quite efficiently with an average efficiency of 71.84 percent. In this study, it was found that banking in Thailand had the highest efficient value followed by Singapore, Malaysia, Indonesia and the least efficient was the Philippines during 2005 - 2012.

Diversification can increase the value of a bank, this is due to drastic changes in the industry that are driven by rapid technological developments, Elsas (2010) also said that the reason for banks to diversify their business is because of the potential for cross-selling to achieve economic reach. (economic of scale). Berger et al. (2010) conducted a study examining the effect of diversification and focus on banking performance using bank data in China in 1996-2006, which states that diversification can be classified into four dimensions, namely: loans, deposits, assets and geographic location. The results of this study found that banks that are more focused on their main activities tend to have higher profits, lower costs and higher profits and cost efficiency.

The results of the study by Levine (2007) found contradictory results where the results of research conducted on 43 (forty three) banks in developed countries during 1998-2002 found that there was a negative influence between diversification on market valuation. This is because the costs arising from diversification are higher than the emergence of economies of scope as a diversification premium. The findings of Marcieca et al. (2007), in a study that examined whether there was an effect of diversification on bank income? Using a sample of 775 small European banks in 1997-2003, it was found that income diversification as measured by the Herfindahl Hirschmann Index (HHI) has a negative relationship with bank income from non-interest income. This could be caused by a lack of experience and expertise from the Bank's management. Diversification can be seen from various dimensions but in this study it follows previous research conducted by Nguyen (2018).

Asset Diversification and Efficiency

Diversification can be measured on the basis of assets and income (Levine, (2007). Asset-based diversification is to measure bank diversification based on the types of assets owned. The types or diversity of assets owned by financial institutions such as banks can be classified as: credit, non-Credit or other activities measurement is done by comparing Credit or Financing with Total Earning Assets (including financing, securities and investment) The measurement of asset diversification in this study refers to asset diversification in the Laeven (2007) study where asset diversification measures the diversity of financial service activities in a bank where it separates credit and non-credit financial services. Finally, to anticipate increased risk, the diversification carried out by banks should be adjusted to the monitoring and screening capabilities of individual banks in providing credit (Christianti, 2011). In

general, diversification of assets or credit for the banking industry is carried out with the hope that risks can be controlled so that defaults can be reduced. Moreover, the opportunity for a bank to fail endogenously is influenced by the choice of the credit portfolio structure of the bank concerned.

Previous studies have shown that diversification has a positive impact on banks, including: diversification will increase bank efficiency (Thakor, 1996); (Berger, 2000). This increase in efficiency can be seen from the decrease in the cost of funds due to the effect of reputation or market power, as well as increasing income from other financial services (Berger & DeYoung, 2001). In addition, diversification will improve the image of management (Rumble et al. 2006). Thus, it will increase competitiveness. Diversification can also increase bank stability because through diversification of bank products it will also diversify risk (Berger, 2000), thereby minimizing risk and the resulting return will be more stable (Lin et al. 2012).

Income diversification and efficiency

Income diversification is stated as an effort to reduce risk because it can stabilize bank income. Portfolio theory states that diversification can reduce risk so that it can maximize profits. This has prompted many banks to diversify their income. The Bank no longer focuses on lending activities, but has expanded its activities to businesses that generate non-interest income, namely from fees and trading. These activities not only impact bank performance but also risk. Banks that carry out diversification activities are not only large banks but small banks (Sianipar, 2016)

Research related to income diversification in the banking industry was carried out in several countries such as America, Europe (Baele et al. 2007); (Laeven, 2007) and Japan (Sawada, 2013). Research on income diversification in Indonesia has also been conducted by several researchers and results that diversification of bank income has a significant effect on the risk and probability of corporate bankruptcy (Hidayat et al, 2012), and (Kusumaningtyas et al. 2016). Several studies have found that diversification of bank income has a performance-reducing effect (Rumble et al., 2006); (Laeven, 2007). Several studies have found that income diversification has a positive impact on bank performance (Baele et al., 2007); (Hackethal et al. 2010) and (Sawada, 2013) and Nguyen (2018).

Stiroh and Rumble (2006) found empirical evidence that a bank that is affiliated with a parent company and carries out diversification activities will provide benefits for its parent company, but these benefits are covered by an increasing risk. Baele et al. (2007) found that diversification of bank income in Europe improved bank performance and reduced non-systematic risk, but this study also found that diversification of bank income had an effect on increasing systematic risk. The Laeven (2007) study found that diversification reduces bank performance. Sawada, (2013) found evidence that income diversification positively affects bank performance and reduces total risk. Kusuma (2012) who examined banks in Indonesia found that income diversification had a negative effect on systematic risk, but had not examined

the impact of diversification on bank performance. Activities that generate non-interest income can provide risk reduction benefits but can also increase risk because they are associated with interest rate risk, credit risk, and foreign exchange risk. In addition, activities that generate non-interest income will have a different impact on the risk of large and small banks (Bertin et al. 2015), (Rous et al. 2008); (Marcieca et al. 2007); (Hidayat, 2012).

The interaction between ownership structure and diversification on efficiency

In the study of Bonin et al. (2005) who have analyzed the effect of the relationship between bank ownership and bank performance as measured by cost efficiency. The results of this study indicate that banks with foreign ownership have a higher score of cost efficiency and profit efficiency than domestic banks. Likewise research conducted by Fries et al. (2005), where this study compares banks with foreign ownership and domestic ownership in Eastern Europe. The results of this study indicate that from 289 banks in 15 countries in Eastern Europe, it is found that banks with foreign ownership have a significant positive relationship with the level of cost efficiency. The study of Fries et al. (2005) using the SFA method also found results where banks with foreign ownership had the highest level of efficiency (most efficient), then followed by domestic private owned banks and state-owned banks were the least efficient with the lowest cost efficiency scores

Nguyen's study (2015) found that banks with domestic ownership strengthen the effect of efficiency on profitability. This study also found a positive impact on private ownership on bank profitability, which means that increased bank privatization can facilitate profitability, and transparency and disclosure of information will be more closely controlled and monitored because more shareholders are involved, so that will pressure banks to operate healthily and more effectively. Moez et al. (2015) stated that the effect of private ownership on ROA and ROE is positive and significant. A study conducted by Meslier (2014) on banks in the Philippines from 1999 to 2005 found that banks with foreign ownership strengthen the effect of efficiency on profitability, while banks with private ownership weaken the effect of diversification on efficiency. Nguyen (2018) and Miah (2017) find that banks with government ownership strengthen the effect of diversification on efficiency. Banks with foreign ownership weaken the effect of asset diversification and funding diversification on efficiency.

The interaction between independent commissioner and diversification on efficiency

The Independent Commissioner has the main responsibility to encourage the implementation of the principles of good corporate governance. An independent commissioner is in the best position to carry out the supervisory function in order to create a company with good governance (Fuji, Halim, & Julizaerma, 2016). Müller's (2014) study found that independent commissioners significantly moderate in minimizing the effect of earnings management on firm value. The effectiveness of the board of commissioners

in balancing the power of the CEO is strongly influenced by the level of independence of the board of commissioners (Wardhani, 2016).

The opportunistic actions of managers that can reduce investment efficiency can be minimized by the presence of independent commissioners (Yapono et al. 2018). Thus, the higher the proportion of independent commissioners will greatly affect the lower the possibility of a company experiencing inefficiency (Deviacita, 2012). Thus, it is hoped that the role of independent commissioners can moderate the relationship between asset diversification and income diversification at the bank.

The study of Hapsoro et al. (2016) found that the interaction variable between financial distress and corporate governance was proven to have a significant negative effect on earnings management. The effectiveness of the board of commissioners in balancing the power of the CEO is strongly influenced by the level of independence of the board of commissioners (Wardhani, 2016). The existence of independent commissioners is necessary to monitor and control the actions of directors which are called opportunistic and the opportunistic actions of managers can reduce efficiency and can be minimized by the presence of independent commissioners (Yapono et al. 2016). Al-Matari's (2014) research found a positive relationship between board size, board meetings, CEO tenure with ROA but not significant.

Control variable

Size and efficiency

The size of the bank (size) is proxied by the size of its assets, the size of the assets is very important in the banking world in fulfilling financial needs in order to carry out its intermediation activities, provide guarantees and carry out other trading transactions such as foreign exchange transactions and other financial services. While other studies from Mester (1996) found insignificant results. Meanwhile, in a study conducted by Muazaroh et al. (2012) found a significant positive effect between bank size on the profit efficiency of banks in Indonesia.

Bank risk and efficiency

Risk management is the main activity of a bank as an intermediary institution that aims to optimize the tradeoff between risk and income, as well as help plan and finance business development appropriately, effectively and efficiently. Risk can be defined as a potential occurrence of an event (events) that can cause losses. Risk in the banking sector, which is a potential event that can be anticipated or unanticipated which will have a negative impact on bank income and capital. These risks cannot be avoided but can be managed and controlled. Studies on conventional banks find that: Changes in credit risk will affect the overall performance of the bank (Anggraeni et al. 2020). In uncertain conditions, banks will diversify their credit portfolios to reduce bank risk or credit risk.

Thus, the higher the credit risk of a bank, the lower the level of bank efficiency. Research conducted by Kaparkis found a positive relationship between bank inefficiency and the ratio of non-performing loans to total loans (Kaparakis et al. 1994). The results of studies on the effect of credit risk on the level of efficiency in various studies have found different results. The study conducted by Altunbas et al. (2001) and Altunbas et al. (2000) stated that the cost efficiency score is not very sensitive to credit risk, while previous studies conducted by Berger & DeYoung (1997) and Anggraeni et al. (2020) stated that credit scores are very sensitive to credit risk and have an impact on banking efficiency.

METHODOLOGY

The aims of this research are to prove empirically and the answer these hypotheses, where developed as follows:

H1: Asset diversification has a significant influence on efficiency

H2: Income diversification has a significant influence on efficiency

H3: Interaction asset diversification and government ownership has a significant influence on efficiency

H4: Interaction asset diversification and foreign ownership has a significant influence on efficiency

H5: Interaction asset diversification and Independent commissioner has a significant influence on Efficiency

H6: Interaction income diversification and government ownership has a significant influence on Efficiency

H7: Interaction income diversification and Foreign ownership structure has a significant influence on efficiency

H8: Interaction income diversification and Independent commissioner has a significant influence on efficiency

Population and sample research

This study uses a population of conventional commercial banks in Indonesia for 9 years from 2010-2018. As for those selected as samples of Conventional Commercial Banks are: there are 78 (seventy-eight) Conventional Commercial Banks, consisting of: Government Banks (State-Owned Banks and Banks Owned by local governments), foreign banks, joint venture banks and national private commercial banks.

Research variables and measurements

The variables in this study consist of the dependent variable (independent variable) and the independent variable (dependent variable) as well as the moderating variable (moderating variable) and the control variable (control variable).

Efficiency

To get the value of bank efficiency, this study uses the Stochastic Frontier Approach (SFA) method. The score from the SFA is 0 (zero) to 1 (one). A score is 1 (one) indicates that the bank is operating efficiently. The variable components used for the cost function in conventional banks are as follows:

Variabel	Definition of Variable Measurement
Variabel Input:	
- P1 (Price of Labour)	Personnel Expenses / Total Assets
- P2 (Price of Fund)	Interest Expense / Total Liabilities
Variabel Output:	
- Q1	Credit extended to parties related to the Bank
- Q2	Credit given by other parties
- Q3 (securities)	Securities owned

In this study using an intermediation approach such as that done by Sealey (1977) and followed by Lin (2005) and Hadad et al. (2003), according to Lin (2005), the actual activity of a banking institution with its function is as an intermediary institution, namely an institution whose main task is to bring together the surplus party with the deficit party (lack of funds), then the input and output variables used in this study use intermediation approach. The intermediation approach taken by Sealey (1977) is also followed by other researchers such as that used by Yudistira (2003) and Arcaya et al. (2017) and Hadad et al. (2003) and Nguyen (2018).

Asset diversification

To find out whether the asset strategy is concentrated or diversified, this study follows the direction of the study conducted by Cajueiro et al (2011) and Nguyen (2018) using the Hirschman Herfindahl Index (HHI). HHI is an indicator of asset concentration where the value ranges from 0 to 1. If the value of HHI ranges from 0 to 1 if it is close to 1 it means that the asset portfolio is getting more diversified Vice versa.

Calculate asset diversification using HHI

HHI formula for asset diversification using the formula:

$$ADIV_{i,t} = 1 - \left(\left(\frac{CLOAN_{i,t}}{EA_{i,t}} \right)^2 + \left(\frac{IBLOAN_{i,t}}{EA_{i,t}} \right)^2 + \left(\frac{SEC_{i,t}}{EA_{i,t}} \right)^2 + \left(\frac{OTHEREA_{i,t}}{EA_{i,t}} \right)^2 \right)$$

In conventional banks where the earning asset (EA) is the sum of the four numerators. Diversified assets (ADIV) are among the most important categories of bank assets: loans to customers (CLOAN), interbank loans (IBLOAN), securities (SEC), and other productive assets (OTHEREA). Therefore, for each bank *i* at time *t*, the asset diversification index is calculated using the method above.

Income diversification

The bank is said to diversify its income if the bank has made equalization efforts, including equalization in obtaining the income it has. So that failure on one income can be offset by returns from other ventures. Thus, income diversification efforts are expected to increase bank efficiency.

To find out whether income diversification strategies are concentrated or diversified, this study follows the direction of the study conducted by Cajueiro et al (2011) and Nguyen, (2018) using the Hirschman Herfindahl Index (HHI). HHI is an indicator of income concentration where the value ranges from 0 to 1. If the value of HHI is close to 1, it means that the income portfolio is increasingly diversified.

Calculate income diversification using HHI

HHI formula for financing diversification using the formula:

$$IDIV_{i,t} = 1 - \left(\left(\frac{II_{i,t}}{TOI_{i,t}} \right)^2 + \left(\frac{CI_{i,t}}{TOI_{i,t}} \right)^2 + \left(\frac{NPFO_{i,t}}{TOI_{i,t}} \right)^2 + \left(\frac{ONII_{i,t}}{TOI_{i,t}} \right)^2 \right)$$

Income diversification (IDIV), for conventional banks following the approach taken by Curi et al. (2015) using interest income (II), commission income (CI), net income from other operations (NPFO), and other non-interest income (ONII). Where TOI is the sum of the absolute values of the four numerators. Like the study of Hackethal et al. (2010), unlike assets and financing, a component of total revenue (TOI), which would lead to a negative division for some income streams and a larger share than one for other income streams. To avoid this problem, we use the absolute value of the four components of income to calculate the TOI.

1. Moderating variables, namely variables that strengthen or weaken the relationship between one variable and another, in this study using 2 (two) moderating variables, there are:

a. Ownership structure. In this study the ownership structure is divided into two groups, Government Ownership and Foreign Ownership. Ownership structure is the proportion of share ownership in each bank. The ownership structure studied includes: Foreign ownership and government ownership. The approach of the two ownership is using a percentage of the amount of ownership in each.

b. Independent Commissioner is a member of the Board of Commissioners who comes from outside the company and has no special relationship with the company where he is appointed as the Board of Commissioners. The proportion of independent commissioners is measured by dividing the number of independent commissioners by the number of commissioners.

Proportion of Independent Commissioners = $\frac{\text{Number of Independent Commissioners}}{\text{Total Commissioners}} \times 100\%$

2. Control variables, which are variables that are controlled or made constant so that the influence of the independent variable on the dependent variable cannot be influenced by external factors that are not examined, in this study 2 (two) control variables are used: Bank Size and Bank Risk. The control variable is the independent variable which in the implementation of the research is not included as an independent variable but rather its existence is controlled (controlled). By controlling for some of these variables, the effect of the independent variable on the dependent variable is a clean (pure) effect and the controlled variable no longer pollutes the dependent variable. Bank size (size) is proxy based on the total assets contained in the financial statements of the sample companies. Bank risk is the risk that occurs as a result of the failure of the counterpart to fulfill its obligations to the bank, both the principal and the loan interest. In this study, the measurement of credit risk or financing risk uses the Non-Performing Loan (NPL) ratio, which is the calculation method in conventional banks by dividing the total loans (substandard, doubtful and loss) divided by the total loans granted.

$$\text{NPL} = \frac{\text{Bad Debt}}{\text{Total Credit}} \times 100\%$$

Research model

To test the factors that determine the cost efficiency, this study uses the panel regression equation as follows: (1) Without moderating variables and (2) With moderating variables.

$$(1) \quad \text{EFF}_{it} = \beta_0 + \beta_1 \text{ADIV}_{it} + \beta_2 \text{IDIV}_{it} + \beta_3 \text{BankRisk}_{it} + \beta_4 \text{Size}_{it} + \epsilon_{it}$$

$$(2) \quad \text{EFF}_{it} = \beta_0 + \beta_1 \text{ADIV}_{it} + \beta_2 \text{IDIV}_{it} + \beta_3 \text{ADIV} \times \text{GOV}_{it} + \beta_4 \text{ADIV} \times \text{FRG}_{it} + \beta_5 \text{IDIV} \times \text{GOV}_{it} + \beta_6 \text{IDIV} \times \text{FRG}_{it} + \beta_7 \text{ADIV} \times \text{IndCit}_{it} + \beta_8 \text{IDIV} \times \text{IndCit}_{it} + \beta_9 \text{BankRisk}_{it} + \beta_{10} \text{Size}_{it} + \epsilon_{it}$$

Where:

EFF – Efficiency; ADIV – Asset Diversification; IDIV – Income Diversification; Bank Risk – bad debt; Bank Size – Total asset; ADIVxGOV - Interaction Asset Diversification and Government Structure; ADIVxFRG - Interaction Asset Diversification and Foreign Structure; IDIVxGOV - Interaction income Diversification and Government Structure; IDIVxFRG - Interaction Asset Diversification and Foreign Structure; ADIVxInd – Interaction Asset Diversification and Independent Commissioner; IDIVxInd - Interaction Income Diversification and Independent Commissioner

RESULTS

Descriptive statistics

Descriptive analysis in this study is used to see an overview of the data used includes the dependent variable and the independent variable. The results of the descriptive analysis of these variables are as follows:

Table 3.1 Results of Variable Descriptive Analysis

Variabel	No	Mean	Maximum	Minimum	Std. Dev.
Efficiency	702	0.863151	1.000000	0.082000	0.189887
Asset Diversification	702	0.333739	0.645249	0.002200	0.128943
Income Diversification	702	0.204534	0.628997	0.006489	0.145414
Government Ownership	702	0.336380	1.000000	0.000000	0.446468
Foreign Ownership	702	0.261938	1.000000	0.000000	0.399930
Independent Commissioner	702	0.556616	1.000000	0.250000	0.148017
Size	702	16.42238	20.79692	12.43246	1.656361
Bank Risk	702	0.013159	0.073800	0.000000	0.011895

Source: Processed from the results of E views - 10

Asset diversification has the lowest value of 0.002200, while the highest value is 0.645249. The average asset diversification value is 0.333739. Income diversification has the lowest value of 0.006489, while the highest value is 0.628997. The average Income diversification is 0.204534. Government ownership has the lowest value of 0.000, while the highest value is 1,000. Foreign ownership has the lowest value of 0,000, while the highest value is 1,000. The average Foreign ownership is 0.261938. The Independent commissioner average was 0.556616. The SIZE average is 16.42238. Bank RISK has the lowest value of 0.000, while the highest value is 0.073800. The average bank RISK was 0.013159. The standard deviation value is smaller than the average $0.011895 < 0.013159$, indicating that the diversity of the Bank RISK data tends to be small.

Results of data processing and hypothesis testing

Panel data regression can be done in three models, there are: common effect, random effect and fixed effect. Thus, based on the Chow and Hausman test, the best panel regression estimation model is the Fixed Effect Model (FEM). The results of hypothesis testing can be seen in the following table 3.2.

Simultaneous hypothesis test results

Simultaneous testing is used to test hypotheses about the presence or absence of the influence of independent variables simultaneously or together on the dependent variable. The test criteria states that if the probability of the F test < level of significance is 5 percent or 0.05, it is stated that the effect of the independent variable on the dependent variable simultaneously.

Table 3.2 Simultaneous Hypothesis Test Results

Bank	Model	F Statistic	Prob.
Conventional	1	20.38368	0.000000
	2	18.46750	0.000000

Testing the simultaneous effect of all models on conventional banks produces a probability value > level of significance ($\alpha = 5$ percent or 0.05). This means that there is a significant effect of Asset diversification, Income diversification which is controlled by size and bank risk, both without moderation and with moderation. simultaneously on Efficiency.

Partial Testing

Partial testing is used to test hypotheses about whether or not the influence of the independent variable partially affects the dependent variable. The test criteria states that if the probability value is <level of sig. ($\alpha = 5$ percent or 0.05), it is stated that the effect of the independent variable on the dependent variable partially is declared. Partial significance testing can be explained as follows:

Table 3.3 Hypothesis Test Results Model 1

Variable	Conventional Bank		
	Coefficient	t-Statistic	Prob.
Asset Diversification	0.131450	3.645441	0.0003
Income Diversification	0.145466	2.119883	0.0344
Size	1.258539	7.133835	0.0000
Bank Risk	-0.116727	-3.496233	0.0005

Source: Eviews-10 processing results. Note: Significance level at 5%

Testing the significance of the effect of asset diversification, income diversification, size, and bank risk on efficiency

The variables Asset diversification, Income Diversification, Size and Bank Risk produce a probability value <significant alpha 5 percent or 0.05. So it can be concluded that there is a significant effect of Asset diversification on Efficiency, Income Diversification on Efficiency, Size on Efficiency, and Risk on Efficiency. So that hypothesis 1 and hypothesis 2 in this study is fulfilled. The resulting coefficient of the effect of the control variables SIZE and Bank RISK on Efficiency is 1.258539 (positive) and -0.116727 (negative), respectively, which means that if SIZE increases by 1, it tends to increase Efficiency by 1.258539 by assuming other variables are constant and if Bank RISK increases 1, it tends to decrease the Efficiency by 0.116727 by assuming the other variables are constant.

Table 3.4 Hypothesis Test Results Model 2

Variable	Conventional Bank		
	Coefficient	t-Statistic	Prob.
Asset Diversification	0.148987	3.948335	0.0001
Income Diversification	0.117002	1.594647	0.1113
Government Ownership	0.222742	0.659356	0.5099
Foreign Ownership	-0.142134	-1.278950	0.2014
Independent Commissioner	-0.033001	-0.970107	0.3324
Interaction Asset Diversification and Government Structure	0.050590	1.154117	0.2489
Interaction Asset Diversification and Foreign Structure	0.052044	1.098380	0.2725
Asset Diversification and Independent Commissioner	0.026622	0.859680	0.3903
Interaction Income Diversification and Government Structure	-0.035510	-0.476247	0.6341
Interaction Income Diversification and Foreign Structure	0.055821	1.036977	0.3002
Interaction Income Diversification and Independent Commissioner	0.001359	0.029622	0.9764
Size	1.323628	7.532850	0.0000
Bank Risk	-0.121354	-3.507981	0.0005

Source: Eviews-10 processing results. Note: Significance level at 5%.

Testing of Interaction Ownership Structure, Independent Commissioner and Efficiency

All interaction variables yield a probability value > of significant alpha of 5 percent or 0.05. So it can be concluded that the variables Government ownership, Foreign ownership and Independent Commissioner are not able to moderate the influence of Asset diversification on Efficiency and Income diversification on efficiency. Thus the hypothesis no. 3 – hypothesis no. 8, stating that the Government ownership, Foreign ownership and Independent commissioner variables were able to moderate the influence of Asset diversification on Efficiency and Income diversification on Efficiency in the study was rejected.

Determination coefficient

The Determination Coefficient is used to determine the magnitude of the diversity of independent variables in explaining the diversity of dependent variables, or in other words to determine the magnitude of the contribution of independent variables to dependent variables. The Determination Coefficient in Regression analysis is denoted by (R²).

Table 3.5 Coefficient Determination

	Model	R-Squared	Adj. R-Squared
Conventional	1	0.727002	0.691336
	2	0.731201	0.691607

The R-square in model 1 influences Asset Diversification and Income Diversification controlled by the SIZE and Bank risk variables on Efficiency in conventional banks worth 0.727002 or 72.7002 percent. The contribution of the influence of the Asset diversification and Income diversification variables controlled by the SIZE and Bank RISK variables to the Efficiency at the conventional bank by 72,7002 percent.

R-square in model 2 the effect of Asset diversification and Income diversification is moderated by Government ownership, Foreign ownership and Independent commissioner controlled by the SIZE and Bank RISK variables on Efficiency in conventional banks is 0.731201 or 73.1201 percent. The contribution of the influence of the Asset diversification and Income diversification variables is moderated by controlled Government ownership, Foreign ownership and Independent Commissioner by the SIZE and bank RISK variables in conventional banks amounting to 73.1201 percent.

DISCUSSION

The findings in this study indicate that asset diversification and income diversification have a significant positive effect on bank efficiency. Asset diversification is one of the strategies used by banks to increase banking cost efficiency. The advantage of asset diversification will create economies of scope, through sharing activities. Empirical studies on asset diversification have also been conducted by previous researchers (Nguyen, 2018); (Elsas et al. 2010); (Laeven, 2007); Mercieca et al. 2007; (Berger et al. 2010), (Stiroh et al. 2006); (Sawada, 2013).

Asset diversification is also associated with the bank's efforts to diversify its distribution of assets, including the distribution of credit or financing. The implementation of bad credit management will cause bad credit, which if it gets bigger will have an impact on the soundness of bank operations. For this reason, efforts are needed to control the risk of default (default risk) as a result of the concentration of the spread of funds. In general, credit diversification in the banking industry is carried out with the hope that risks can be controlled so that defaults can be reduced. In fact, banks are required to diversify as an application of prudential principles in order to reduce the potential for bank business failure (Christianti, 2011).

The findings of Curi (2015) concluded that asset diversification was able to increase bank efficiency during the consolidation period. Likewise, the findings of Berger (2010) which found that there was a positive effect of asset diversification on efficiency. Besides that, it is also supported by the findings of Elsas, et. All. (2010) which states that diversification is able to handle future uncertainty so that it is profitable in the long term. Income

diversification is an activity carried out by banks to be able to earn income other than interest on loans, this income can be obtained from charging fees for financial services provided to customers. The findings that have been made by Alhassan (2015) using SFA reveal a high level of efficiency. The analysis of the efficiency score by two categories of bank size shows that large banks have high cost efficiency and efficiency profits compared to small banks. This relationship was found between income diversification and efficiency, while size was also considered important in enabling banks to exploit the potential benefits of income diversification.

Dad's research (2018) aims to explore the impact of income diversification on the performance of commercial and Islamic banks in Pakistan for the 2007-2013 period. The results showed a positive impact of income diversification on the performance of commercial banks. The findings of this study are very helpful for investors and banks in the importance of income diversification in increasing company performance and value.

Diversification assets which are moderated by private and foreign ownership and the presence of independent commissioners have no significant positive effect on bank efficiency. A study conducted by Weill (2007) concluded that there was an increase in the banking sector controlled by foreign capital, the majority of which occurred in countries in transition. This study also conducted a comparative analysis of the performance of foreign-owned and domestic-owned banks operating in the Czech Republic and Poland. Likewise, the findings from the study of Berger et al. (1997) using a stochastic approach, stated that on average banks with foreign ownership are more efficient than banks owned by non-foreigners.

Income diversification moderated by private ownership has a negative and no significant effect on bank efficiency. According to Su (2010), the government has a great influence on the selection of managers as company managers. The study of Wanniarachchige et al. (2011), state that state-owned banks will show worse performance results, this is due to interference from political interests in their decision making. The study of Fries et al. (2005) using the SFA method also found the same results, where state-owned banks were the least efficient with the lowest cost efficiency scores. Government banks in Indonesia are large banks that distribute large amounts of credit, so that the number of non-performing loans is also larger (Micco, Panizza & Yan, 2007).

CONCLUSION

This study aims to unveil the role of asset diversification and income diversification on bank efficiency using the sample from commercial banks from Indonesia. On average the mean of efficiency is around 86 percent meaning there is a 14 percent possibility for improvement. From the study using Model 1, there is a strong evidence that asset diversification and income diversification are positive and significant to the efficiency. The coefficient for both of diversification variable is almost similar (13 percent and 14 percent) indicating the equal importance. Control variables are also significant and as expected where credit risk is negative and size are positive.

Results from model 2 showed that asset diversification is positive and significant. However the impact of ownership structure and independent commissioner enhance the efficiency but not strong enough to make it significant. There is no strong different on the impact of foreign and government ownership on efficiency. For income diversification moderated by government ownership result negative meaning it hinders the efficiency. Foreign ownership and independent commissioner although it is enhancing the income diversification on the bank efficiency but still not significant. For control variable, size is positive and significant and for the risk variable, the result is negative and significant.

Managerial implication of this study is the income and asset diversification should be increased for the sake of efficiency and at the same time increase the asset size and reduce the credit risk. Future research should consider governance practice using alternative variable such as GCG index.

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