



The Effect of Bank Size, Leverage, and Loan to Deposit Ratio (LDR) on Bank Profitability

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ABSTRACT

This study aims to examine the impact of Bank Size, Leverage (Debt Ratio), and Loan-to-Deposit Ratio (LDR) on Bank Profitability, as proxied by Return on Assets (ROA), given inconsistencies in previous empirical findings. Secondary data from Indonesian banking companies from 2015–2019 were used and analyzed using the Random Effects Model (REM) regression method in EViews. The results of partial hypothesis testing indicate that Bank Size, Leverage, and LDR do not have a statistically significant effect on Return on Assets (ROA) (Probability > 0.05). This finding indicates that a bank's structural characteristics and risk/liquidity strategy have not been proven to be the main determinants of a bank's ability to generate profits from its assets during the period studied.

INTRODUCTION

The banking sector represents a fundamental pillar within the national financial system and economy. As the main intermediary institution, banks play a vital role in driving economic activity through their function of mobilizing funds from the public and channelling them back in the form of credit. Therefore, the stability and Profitability of banks serve as critical indicators that must be maintained to ensure operational sustainability and public trust. Profitability, commonly proxied by *Return on Assets* (ROA), reflects the effectiveness of bank management in utilizing all possessed assets to generate net profit. High number of ROA not only indicates healthy performance but also serves as a primary attraction for investors. To achieve optimal profitability, this study focuses on three key internal factors widely hypothesized to influence it: Bank Size, *Leverage*, and *Loan to Deposit Ratio* (LDR). Bank Size, measured by the logarithm of total assets, is often associated with economies of scale, risk diversification, and better funding access, which theoretically should have a positive impact on profitability. Leverage (the ratio of Liabilities to Assets) measures the extent to which a bank relies on debt or third-party funds to finance its assets. While controlled leverage can increase ROA through the financial multiplier effect, excessive use of debt potentially suppresses profits due to high risk and cost burdens. Meanwhile, LDR is a liquidity ratio that gauges the aggressiveness of credit disbursement. A high LDR indicates significant potential interest income from productive assets, yet it presents a *trade-off* with increased liquidity and non-performing loan (NPL) risks.

Although these three internal variables have been extensively researched, empirical findings within the Indonesian banking market reveal significant inconsistencies (empirical gap). Regarding Bank Size, some studies support a positive effect, consistent with the theory of economies of scale, while others find negative or insignificant effects. Similarly, the relationship between Leverage and profitability remains controversial; some researchers find a positive effect, while others observe a negative impact due to high debt burdens. Inconsistencies also occur with LDR, though many studies find a positive correlation as loans are the primary source of income, other findings conclude a negative effect, suggesting that credit aggressiveness leads to increased NPLs that erode profits. This non-uniformity of results indicates the presence of heterogeneous characteristics among banks (differences in management, operational region, and capital) that are often not adequately captured by standard OLS methods. Therefore, to address this issue of inconsistent findings and to control for both cross-sectional and time-series variations, this study opts to employ a panel data methodology using EViews. This methodological choice, which will be preceded by the Chow Test, Hausman Test, and Lagrange Multiplier Test to determine the optimal estimation model, aims to provide more accurate and comprehensive empirical evidence regarding the partial and simultaneous effects of Bank Size, Leverage, and LDR on Bank Profitability among Indonesian listed banks.

LITERATURE REVIEW

Signaling Theory

The Signaling Theory that is developed by Ross (1977) explains that corporate managers who possess more complete information regarding the company's condition tend to deliver such information to the potential investors (Mariani et al., 2018). The main objective is to increase the company's stock price. This theory also explains how companies communicate information to users of financial statements. Management states that they apply conservative accounting principles, which result in increased earnings. Signaling Theory is used as a conceptual basis to help explaining the nexus between a company's financial performance and its firm value.

Profitability

According to Gitman and Zutter (2012), profitability is the result of the relationship between revenues and expenses generated using an organization's assets in production. Sujoko and Soebiantoro (2007) define profitability as a company's ability to generate profits within one year. Harjadi (2015) states that *Return on Assets* is one of the financial ratios commonly employed to determine the level of a firm's profitability.

Leverage

According to Allen (2003), *leverage* is a technique of accumulating and using borrowed funds to acquire assets that are beneficial to the business, such that the income generated from these assets exceeds the borrowing costs. Syamsuddin (2014) states that *leverage* is a company's ability to increase the rate of return for its owners by using assets or funds that carry fixed costs. Leverage has a significant and negative effect on profitability, as noted by Dawar (2014), Fareed et al. (2016), and Isik (2017).

H1: *Debt to Equity Ratio* affects *Return on Assets*.

Liquidity

Liquidity, according to Pastor and Stambaugh (2003), is "the ability to execute large transactions quickly, at low cost, and without affecting prices." Sudana (2011) defines liquidity as a ratio that calculate a company's ability to meet its short-term obligations. Liquidity has a positive and significant effect on profitability (performance), as it reflects the benefits of superior working capital management and the gains obtained from low interest rates (Dawar, 2014; Durrah et al., 2016; Isik, 2017).

H2: *Current Ratio* affects *Return on Assets*.

Bank Size

Bank size refers to the magnitude of a firm, which can be calculated by the value of its total assets. Companies with larger assets typically have greater resources, enabling them to reduce transaction costs. Haryanto (2018) states that the larger the company, the lower its fixed costs. Studies by Adelopo et al. (2018), Dewi & Tenaya (2017), and Yuniari & Badjra (2019) show that bank size

significantly affects bank profitability. However, Vernanda & Widyarti (2016) and Martins et al. (2019) find that *bank size* does not have a significant effect on profitability.

H3: *Bank Size* affects *Return on Assets*.

METHODOLOGY

Type and Research Approach

This study employs a quantitative research approach, as the entire analysis is conducted by processing numerical company data and statistically examining the relationships among variables. The quantitative approach enables the researcher to measure the influence of leverage, liquidity, firm size, and corporate activities on profitability using objective mathematical models. The data obtained are analyzed with the assistance of statistical software, resulting in empirical findings that can be scientifically justified and reliably accounted for.

Data Sources and Types

Secondary data is used in this study, by obtaining indirectly through official corporate documents. The secondary data consist of annual financial statements of companies downloaded from the official website of the Indonesia Stock Exchange (IDX). The use of secondary data is chosen because the required financial information has been comprehensively presented in audited financial statements, making it more accurate, reliable, and suitable for advanced statistical analysis. The financial data collected include total assets, total equity, total liabilities, current assets, current liabilities, net sales, cost of goods sold, inventory, accounts receivable, and net income for the period 2013–2024. All of these data serve as the basis for calculating the financial ratios used as research variables.

Population and Sample

Banking companies officially listed on the Indonesia Stock Exchange (IDX) during the observation period from 2013 to 2024 is selected to be the population in this study. The population is selected because the banking sector represents a highly regulated and consistently reporting financial industry, making it particularly suitable for panel data analysis.

The research sample is determined using the purposive sampling method, which is a sampling technique based on specific criteria established by the researcher. This method is applied to select samples that are appropriate for obtaining homogeneous data that are relevant to the objectives of the study. The criteria used in selecting the sample are as follows:

1. Banking companies listed on the Indonesia Stock Exchange (IDX).
2. Banking companies that publish complete consolidated annual financial statements consecutively from 2013 to 2024.
3. Financial statements that are available and presented in Rupiah (IDR).
4. Banking companies that possess complete data for all research variables, namely Bank Profitability (ROA), Bank Size, Leverage, and Loan to Deposit Ratio (LDR), throughout the observation period.

Research Variables and Operational Definitions

Dependent Variable: Profitability (Return on Assets – ROA)

Return on Assets (ROA) is employed as the dependent variable, which is a ratio measuring a firm's ability to obtain profit using its total assets. ROA is calculated by comparing net income to total assets. This ratio is selected because it effectively reflects the firm's efficiency in utilizing its assets to obtain profits. A higher ROA shows a better financial performance. ROA is calculated using the formula:

$$ROA = \frac{\text{net profit}}{\text{total assets}}$$

Independent Variables

1. Leverage (Debt to Equity Ratio)

Debt to Equity Ratio (DER) shows the scope to which a company relies on debt compared to its own capital. It is calculated by comparing total liabilities to total equity. A higher DER signifies greater financial risk due to increased debt and interest burdens. This variable is included because a company's financing structure significantly affects its profitability.

$$DER = \frac{\text{total debt}}{\text{total equity}}$$

2. Liquidity (Current Ratio)

The Current Ratio (CR) shows a firm's ability to meet short-term obligations using its current assets. A higher ratio shows a stronger ability to fulfill short-term liabilities. Liquidity is a crucial factor as it is directly related to the company's operational stability, which can influence profit generation.

$$CR = \frac{\text{current assets}}{\text{current debt}}$$

3. Firm Size

Firm size represents the scale of a company and is calculated using the natural logarithm of total assets. Firm size is considered an important factor because companies with larger asset bases generally possess stronger operational and financial capabilities, which may affect profitability. It also reflects business stability and competitiveness in the market environment.

$$\text{Size} = \ln(\text{Total Assets})$$

Data Analysis Techniques

This study uses Panel Data Regression Analysis as the primary technique to test the hypotheses. The analysis was conducted using EViews software. Panel data was chosen because it combines the 2013–2024 time dimension and the

individual dimension, thus addressing the issue of heterogeneity and producing efficient estimates. The analysis steps are as follows:

1) *Descriptive Statistical Analysis*

Conducted to generate an initial overview of the data characteristics of each research variable, including the mean, standard deviation, minimum, and maximum values during the observation period.

2) *Panel Data Regression Model Selection*

This test is used to determine the most appropriate estimation model from three alternative models: the Common Effects Model (CEM), the Fixed Effects Model (FEM), and the Random Effects Model (REM). The best model is determined through a series of tests, namely:

- a. Chow Test: Used to select between the CEM and FEM models.
- b. Hausman Test: Used to select between the FEM and REM models.
- c. Lagrange Multiplier Test (LM Test): Used to select between the CEM and REM models (if the Chow Test selects the CEM).

3) *Classical Assumption Test*

After the best model is selected, a classical assumption test is performed to ensure the linear regression model meets the Best Linear Unbiased Estimator (BLUE) criteria. The tests performed include:

- a. Normality Test: To test whether the residuals are normally distributed.
- b. Multicollinearity Test: To test whether there is a perfect or near-perfect correlation between the independent variables.

4) *Hypothesis Testing*

Hypothesis testing is conducted on the best model that passes the classical assumption test:

- a. Partial Significance Test (t-Test): To test the effect of each independent variable individually on the dependent variable.

Research Location and Period

This research focuses on secondary data sourced from public financial reports of banking companies in Indonesia. Data were obtained online from the official website of the Indonesia Stock Exchange (IDX), the official websites of the sample banks, and other reliable financial data sources.

The research period covers a 12-year observation period (time series data), from 2013 to 2024. This period was chosen to obtain sufficiently long and comprehensive data, encompassing different economic cycles, so that the analysis results can provide a more stable and robust picture of the influence of variables on bank profitability

RESEARCH RESULTS

Descriptive Statistics Test

Table 1 Descriptive Statistical Test Result

Date: 12/01/25 Time: 23:42
 Sample: 2013 2024

	Y	X1	X2	X3
Mean	0.006270	415526.3	0.887386	0.977592
Median	0.006044	435735.4	0.885415	0.978212
Maximum	0.009989	454722.7	0.939552	1.038676
Minimum	0.003805	43454.76	0.844700	0.909663
Std. Dev.	0.001302	91167.93	0.021137	0.020478
Skewness	0.658547	-3.830211	0.246989	-0.026196
Kurtosis	3.148171	15.81533	2.650825	4.853547
Jarque-Bera	5.270068	668.7440	1.097812	10.31515
Probability	0.071717	0.000000	0.577581	0.005756
Sum	0.451435	29917895	63.89180	70.38663
Sum Sq. Dev.	0.000120	5.90E+11	0.031721	0.029774
Observations	72	72	72	72

Based on the results of descriptive statistics on panel data, a general description of the research variables is obtained, namely Bank Size, Leverage, Loan to Deposit Ratio (LDR), And Bank Profitability (ROA). This descriptive statistic shows the characteristics of the data distribution of each variable during the research period. In general, the average value (mean) describes the central tendency of the bank data studied. Meanwhile, the value minimum and maximum shows the range or variation in bank size, leverage level, and LDR ratio across banking companies. This variation is natural because banks in Indonesia have varying operational scales, business models, and intermediation capacities.

Based on the descriptive results, several conclusions can be drawn regarding the characteristics of the sample: 1) Variable Bank Size shows a significant disparity in asset size between banks, reflecting the co-existence of large and small capitalization banks in the research sample. 2) Variable Leverage has a variation that is not too extreme, indicating that the majority of banks in the sample implement relatively stable and uniform debt management policies. 3) Variable LDR shows different levels of credit distribution, depending on the strategy of each bank. 4) Variable Profitability (ROA) shows the variation

in profitability between banks, which is influenced by management's ability to optimize assets.

Selection of panel estimation model

To determine the best model in panel data regression, three stages of testing were carried out: the Chow Test, the Hausman Test, and the Lagrange Multiplier (LM) Test.

CHOW test

Table 2 CHOW Test Results

Redundant Fixed Effects Tests			
Equation: MODEL_FEM			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	18.535112	(5,63)	0.0000
Cross-section Chi-square	65.134034	5	0.0000

From the table above, both the Cross Section F and Chi Square probability values are smaller than Alpha 0.05 so this condition rejects the null hypothesis (H0) and accepts the alternative hypothesis, which means the model Fixed Effect Model (FEM) is better. The results indicate that the selected model is the Fixed Effect Model (FEM). This means that there are differences in specific characteristics of each bank that influence profitability, so individual effects need to be taken into account.

Hausman Test

Table 3 Hausman Test Results

Correlated Random Effects - Hausman Test			
Equation: MODEL_REM			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.064930	3	0.1671

After selecting FEM in the first stage, the Hausman Test was done to compare FEM and REM. The test results show a probability value greater than 0.05. Therefore, the statistical decision taken is to choose the REM. This result indicates that variation among individuals (banks) is assumed to be random and not correlated with independent variables in the model, so the use of REM is considered more efficient.

Lagrange Multiplier Test (LM Test)

The LM test was not conducted because it was intended to compare CEM and REM. Since there is no CEM, REM is used.

Table 4 REM Test Results

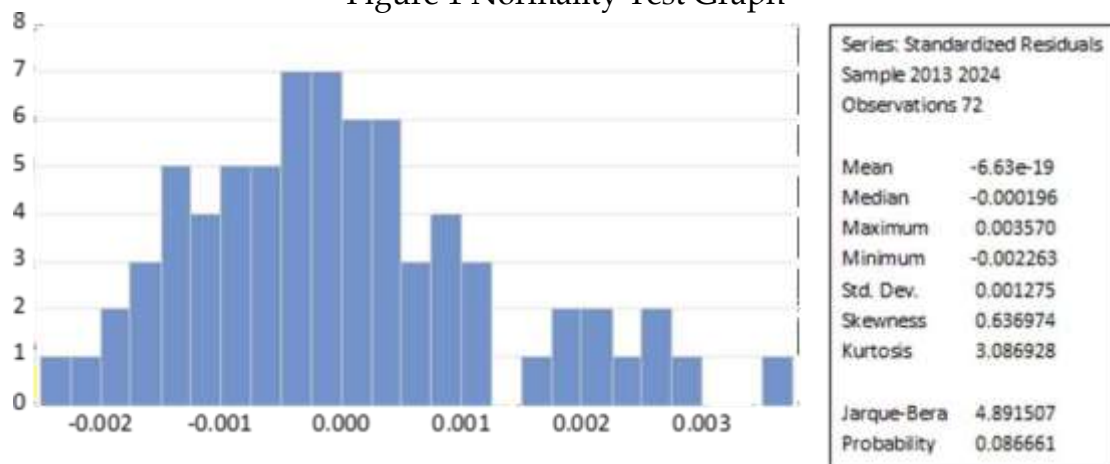
Lagrange Multiplier Tests for Random Effects
 Null hypotheses: No effects
 Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	118.8097 (0.0000)	0.221265 (0.6381)	119.0310 (0.0000)
Honda	10.89999 (0.0000)	0.470388 (0.3190)	8.040069 (0.0000)
King-Wu	10.89999 (0.0000)	0.470388 (0.3190)	9.300746 (0.0000)
Standardized Honda	12.25739 (0.0000)	0.729325 (0.2329)	5.955294 (0.0000)
Standardized King-Wu	12.25739 (0.0000)	0.729325 (0.2329)	7.626549 (0.0000)
Gourieroux, et al.	--	--	119.0310 (0.0000)

The LM test was actually conducted to compare CEM vs REM. However, because in the previous test Common Effect Model was not used, and Hausman's results had led to REM, then the Random Effect Model (REM) was automatically selected as the final model. Thus, the panel regression in this study used the Random Effect Model.

Classical Assumption Tests
Normality Test

Figure 1 Normality Test Graph



The probability value is > 0.05 (meaning normal)
 The normality test results show a probability value >0.05, so the data is stated to be normally distributed. This means the regression model has met one of the main requirements of statistical analysis.

Multicollinearity Test

Table 5 Multicollinearity Test Results

	X1	X2	X3
X1	1.000000	-0.019108	0.006685
X2	-0.019108	1.000000	-0.028906
X3	0.006685	-0.028906	1.000000

There is no multicollinearity because the correlation value is <0.09 . The results of the correlation test between variables show a correlation value of <0.09 , so there is no multicollinearity. This means that the variables Bank Size, Leverage, And LDR do not have a strong linear relationship with each other, so each is worthy of inclusion in the regression model.

Multiple Regression**Regression Equation**

$$Y = -0,002 -1,56 X_1 + 0,008 X_2 + 0,002 X_3$$

With the following information:

Y = Profitability (ROA)

X₁ = Bank Size

X₂ = Leverage

X₃ = LDR

DISCUSSION***The Influence of Bank Size on Profitability***

The coefficient of Bank Size is -1.56 , which means it has a negative effect on profitability. The economic interpretation is that as bank size increases, profitability tends to decline. This phenomenon can occur because: 1) Large banks tend to have a larger operational cost structure. 2) Bank expansion requires high costs, which suppresses ROA. 3) Large banks must perform more complex intermediation functions. If the probability value of this variable is >0.05 , it is statistically insignificant. This means that regardless of bank size, it does not have a strong impact on bank profitability.

The Effect of Leverage on Profitability

The leverage coefficient is 0.008 , indicating a positive effect on profitability. This means that the higher the leverage, the greater the bank's ability to utilize debt as a funding source to increase revenue. If the probability is >0.05 , this effect is statistically insignificant, so increasing leverage has no significant impact on ROA.

The Effect of LDR on Profitability

The LDR coefficient is 0.002 , indicating a positive but small effect. This means that the higher the LDR, the greater the bank's profitability, as more third-party funds are successfully disbursed as credit. However, if the probability value is >0.05 , the positive relationship is not statistically significant. Therefore, high credit distribution does not necessarily increase profitability if credit risk increases.

Hypothesis Testing

H0 = there is no influence of X on Y (prob>0.05)

H1 = there is an influence of X on Y (prob<0.05)

Based on the data in the file, all variables have probability values >0.05, so it can be concluded that:

1) Bank Size has a t-Statistic value of -0.138 with a Prob. value of 0.8905 (>0.05). Therefore, it can be concluded that Bank Size does not have a significant effect on Profitability.

2) Leverage has a t-Statistic value of 1.591 with a Prob. value of 0.1162 (>0.05). Therefore, it can be concluded that Leverage does not have a significant effect on Profitability.

3) LDR has a t-Statistic value of 0.384 with a Prob. value of 0.7020 (>0.05). Therefore, it can be concluded that LDR does not have a significant effect on Profitability.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of panel data regression analysis using the *Random Effects Model (REM)*, this study concludes that Bank Size, Leverage, and LDR do not significantly influence Bank Profitability (*ROA*). Specifically, although Bank Size exhibits a negative influence, and Leverage and LDR exhibit a positive influence on *ROA*, these influences are not statistically strong. This conclusion confirms the market heterogeneity and complexity of the Indonesian banking industry, where variations in assets, liabilities, and lending are insufficient to explain disparities in bank profitability. It is recommended that future research consider other variables, such as operational efficiency (*BOPO*), risk management quality (*NPL*), or variables that test mediating/moderating pathways to provide a more comprehensive explanation of bank profitability performance.

ADVANCED RESEARCH

Building on the finding that Bank Size, Leverage, and the Loan to Deposit Ratio (LDR) do not have a significant effect on bank profitability in Indonesia, advanced research should move toward developing a more comprehensive analytical framework by incorporating dynamic internal and external determinants, such as operational efficiency (*BOPO*), risk management quality (*NPL*), corporate governance, and macroeconomic as well as regulatory factors. Furthermore, the application of more advanced methodological approaches, including dynamic panel data models (*GMM*) or non-linear estimation techniques, is expected to better capture lag effects, endogeneity issues, and heterogeneity across banks. Such an approach is essential to explain why structural bank characteristics alone are insufficient to determine profitability and to provide stronger theoretical and empirical contributions for banking management strategies and financial policy formulation in emerging markets.

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