



## **OPERATIONAL RISK AND BANK PROFITABILITY: ANALYZING BOPO AND EFFICIENCY RATIOS IN INDONESIAN COMMERCIAL BANKS**

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### **ABSTRACT**

The banking industry has a crucial role in the financial stability of a country. In this context, operational risk management is an important factor that affects the profitability of banks. This study aims to analyze the relationship between operational risk, which is measured using Operating Costs to Operating Income (BOPO) and Efficiency Ratio, on the profitability of commercial banks in Indonesia represented by Return on Assets (ROA). This study uses panel data from 49 commercial banks in Indonesia during the period Q3 2012 to Q3 2024. The analysis was carried out using the Ordinary Least Squares (OLS), Fixed Effects, and Random Effects methods to identify the impact of operational risks on profitability. The results show that BOPO and Efficiency Ratio have a significant negative influence on ROA. This indicates that increased operational risk, both through cost efficiency and asset efficiency, can reduce bank profitability. In addition, macroeconomic variables such as Gross Domestic Product (GDP) and bank-specific variables such as Non-Performing Loans (NPLs) were also found to have a significant effect on ROA. This study emphasizes the importance of implementing effective operational risk management strategies to improve bank financial performance. This study contributes by providing empirical evidence on the relationship between operational risk and profitability in the context of Indonesian banking, and offers recommendations for strengthening operational risk management through cost efficiency, regulatory compliance, and strengthening internal oversight.

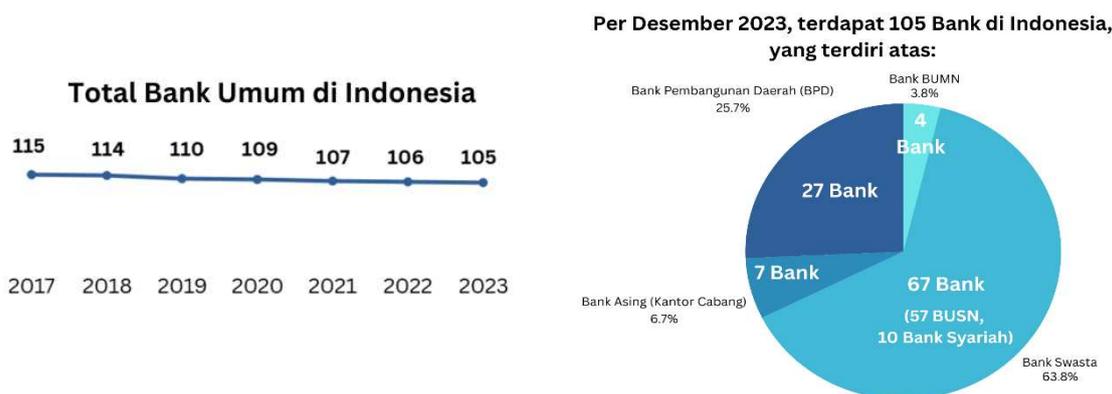
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### **INTRODUCTION**

A country's economic growth is highly dependent on the stability of the banking sector. As a financial intermediary institution, banks collect funds from the public and distribute them to those in need, thus playing a central role in economic development (Mishkin, 2017). Based on the Indonesian Banking Statistics (SPI) published by the Financial Services Authority (OJK) in December 2023, there are 105 banks in Indonesia, but this number has decreased during the

2017–2020 period. The decline was caused by the inability of a number of banks to meet the minimum core capital requirements, which forced business mergers, acquisitions, and changes in institutional status (OJK, 2023). This phenomenon highlights the importance of operational efficiency and risk management in maintaining the sustainability of the banking sector. Efficiency increases competitiveness and stability, while risk management protects banks from potential losses that could threaten their operations (Berger & Humphrey, 1997).

**Figure 1. Overview of Domestic Banks in Indonesia**



Source: Indonesian Banking Statistics December 2023, OJK

The banking industry faces a variety of risks, including operational risks, which are defined by the Basel Committee on Banking Supervision (2021) as the risk of loss due to internal process failures, human error, system disruptions, or external events. This risk has a significant impact on the efficiency and profitability of banks. Profitability is often measured through indicators such as Return on Assets (ROA), which is one of the benchmarks of a bank's financial performance (SERGHINE et al., 2023). Effective risk management allows banks to identify and mitigate potential losses due to operational, credit, and market risks (Al - Tamimi & Al - Mazrooei, 2007). By implementing a comprehensive risk management framework, banks can improve financial stability and achieve sustainable profitability (Meulbroek, 2008;).

Previous literature has shown a varied relationship between operational risk and bank profitability. Qabajeh et al. (2023) in their study of the banking sector in the MENA region showed that operational risk, measured through efficiency ratios, negatively impacts Return on Assets (ROA) and Return on Equity (ROE). This indicates that operational inefficiencies can significantly reduce the bank's financial performance. They emphasized that poorly managed operational risks can worsen banks' ability to manage operational expenses, ultimately harming profitability. Meanwhile, Batten and Vo (2019) highlight that the profitability of banks in emerging markets, such as Vietnam, is highly dependent on operational efficiency and effective risk management. The study found that good risk management can not only improve cost efficiency but also help banks mitigate potential losses from market risk, credit risk, and operational risk. Therefore, they recommend more integrated risk management to improve bank financial performance in a dynamic and competitive context. The inconsistency of other research results, such as (Apriani et al., 2023) which showed that BOPO has a significant influence on ROA, or (Hidayat, 2022), who identified BOPO as the main indicator of bank operational efficiency, further emphasized the need for further research in the context of Indonesian banking.

Taking into account the unique characteristics of Indonesia's banking sector, this study is important to understand how operational risk impacts profitability, particularly through operational efficiency management (Abdullah et al., 2011). This study aims to analyze the relationship between operational risk and profitability of commercial banks in Indonesia. Operational risk is measured through BOPO and Efficiency Ratio, while ROA is used as an indicator of profitability. BOPO measures operational efficiency by comparing operating costs to operating income, where a lower ratio indicates better efficiency. Efficiency Ratio measures efficiency by comparing operational expenses to the bank's total assets. **Research Hypothesis**  
 $H_0$  : There is no effect between bank profitability measured by ROA (Return on Assets) and operational risk measured by efficiency ratio and BOPO.

**Sub-hypothesis:**

- $H_{01}$ : There is no significant effect between bank profitability measured by ROA and operational risk measured by efficiency ratio.
- $H_{02}$ : There is no significant effect between bank profitability measured by ROA and operational risk measured by BOPO.

The research is expected to provide recommendations for banks and regulators to improve operational efficiency and profitability through better risk management.

**RESEARCH MODEL**

The research method is a scientific approach used to obtain data with a specific purpose (Sugiyono, 2013). This study adopts a quantitative approach by using a panel data analysis method to test the relationship between operational risk and profitability in commercial banks in Indonesia. This quantitative approach focuses on numerical data and allows systematic analysis of relationships between variables (Azwar, 2014). This method allows testing dynamic relationships between variables by considering time differences and between units (Baltagi & Baltagi, 2008). The research measures are systematically structured to ensure the validity and reliability of the findings, following quantitative research guidelines (Creswell, 2018).

**Data**

This study focuses on commercial banks in Indonesia that are listed in the Indonesian Banking Statistics published by the Financial Services Authority (OJK) during the period Q3 2012 to Q3 2024. The study population includes all commercial banks in Indonesia that met the data completeness criteria during the period. The sampling technique uses purposive sampling with the following main criteria:

1. The bank has complete data related to the variables measured, including Return on Assets (ROA), Operating Costs to Operating Income (BOPO), and Efficiency Ratio.
2. The bank did not experience any changes in institutional status during the study period.
3. This study uses data from the Indonesian Banking Statistics published by the OJK, which includes 49 observations of commercial banks in Indonesia in the observation period between Q3 2012 to Q3 2024.

**Variable Selection and Measurements**

**Dependent Variables**

ROA (Return on Assets) is the main indicator to measure the efficiency of banks in utilizing their assets to generate profits. A higher ROA value indicates a bank's better ability to use its assets optimally to earn profits (SERGHINE et al., 2023). As one of the measures of profitability, ROA is an important parameter in assessing the bank's overall financial performance (Mishkin, 2017).

$$ROA = \frac{\text{Pendapatan Bersih setelah Pajak}}{\text{Total Aset}} \dots\dots\dots (1)$$

Independent Variables

- BOPO (Operating Costs to Operating Income), where this ratio measures the operational efficiency of the bank. A lower ratio indicates that the bank is more efficient in managing its operating costs compared to the revenue earned.

$$BOPO = \frac{\text{Biaya Operasional}}{\text{Pendapatan Operasional}} \dots\dots\dots (2)$$

- Efficiency Ratio, which measures the operational efficiency of a bank by comparing operational expenses to the total assets owned by the bank.

$$\text{Efficiency Ratio} = \frac{\text{Beban Operasional}}{\text{Total Aset}} \dots\dots\dots(3)$$

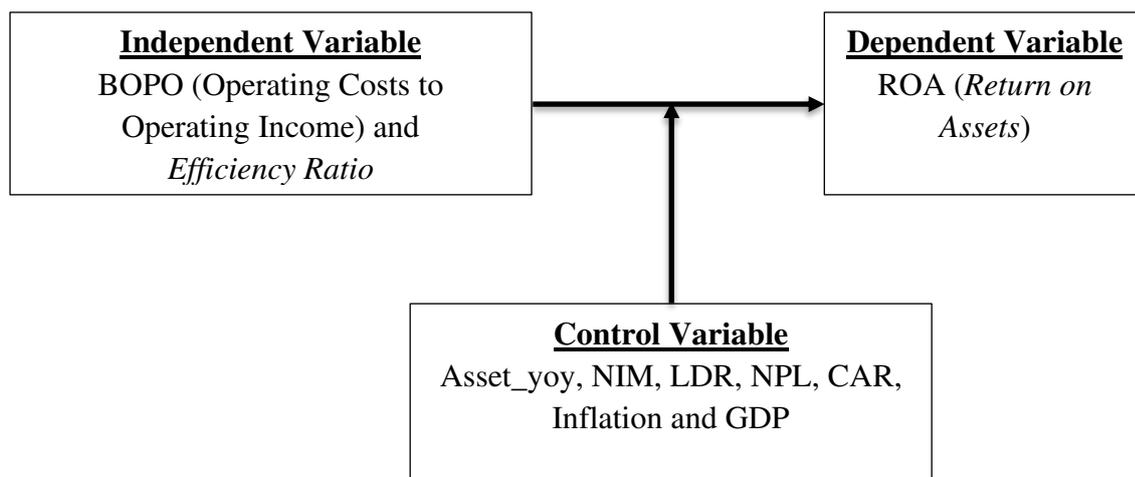
Control Variables

- **Asset\_yoy** (Annual Asset Growth): Measures the growth of a bank's assets over the years.
- **NIM** (Net Interest Margin): Measures the net profit margin that a bank generates from credit and lending activities.
- **LDR** (Loan to Deposit Ratio): Measures the ratio of loans provided by banks to total deposits owned.
- **NPL** (Non-Performing Loan): Measures the amount of a loan that is non-performing or illiquid.
- **CAR** (Capital Adequacy Ratio): Measures the adequacy of a bank's capital to bear credit risk.
- **Inflation** and **GDP**: Measures the influence of macroeconomic conditions on bank profitability.

**Research Model**

The model used in this study tested the effect of operational risk, measured by BOPO and efficiency ratio, on ROA as a dependent variable. The panel data analysis will be applied using a regression model to assess the relationship between risk factors and profitability.

**Figure 2. Research Model**



This model will use Ordinary Least Squares (OLS), Fixed Effects, and Random Effects techniques to determine the most appropriate model in analyzing the relationship between operational risk and profitability. Various statistical tests, such as F-statistic, likelihood ratio,

and Hausman test, will be used to test the validity of the hypothesis and determine the model that best matches the data. The regression model used can be described as follows:

$$ROA_{i,t} = \alpha + \beta_1 BOPO_{i,t} + \beta_2 ER_{i,t} + \gamma_1 Asset\_yoy_{i,t} + \gamma_2 NIML1_{i,t} + \gamma_3 LDRL1_{i,t} + \gamma_4 NPL_{i,t} + \gamma_5 CAR_{i,t} + \gamma_6 Inflasi_{i,t} + \gamma_7 GDP_{i,t} + \epsilon_{i,t} \dots\dots\dots(4)$$

Where:

- ROA<sub>i,t</sub> is the Return on Assets from bank i at the time t,
- BOPO<sub>i,t</sub> is the Operating Cost to the Operating Income from bank i at the time t,
- ER<sub>i,t</sub> is the Efficiency Ratio of bank i at time t,
- The control variables represented by asset growth, net interest margin, loan-to-deposit ratio, non-performing loans, capital adequacy ratio, inflation, and GDP of bank i at t,
- α is a constant (intercept),
- β<sub>n</sub> and γ<sub>n</sub> is the coefficient of the related variables,
- ε<sub>i,t</sub> is the error term (estimation error) from the bank at the time of it.

## RESULTS AND DISCUSSION

The analysis carried out in this study is based on data obtained from the Indonesian Banking Statistics Financial Services Authority. In this study, the focus of the analysis will be directed to the operational risk aspect represented by the BOPO variable and the Efficiency\_Ratio to the bank's profitability represented by the ROA variable.

### Descriptive Analysis

**Table 1. Statistical descriptive dependent variables and independent variables model 1**

Variable	Observations	Mean	Std Dev	Min	Max
ROA	49	2.516677	.3767263	1.59391	3.112846
BOPO	49	79.75751	3.53031	74.0795	88.84335
Efficiency_Ratio	49	4.184402	1.734635	1.51204	7.563005
Asset_yoy	49	10.22867	3.692174	5.17946	18.92105
NIML1	48	4.968255	.419788	4.21277	5.646842
LDRL1	48	87.35775	4.894479	77.4857	94.97841
NPL	49	2.578017	.4080632	1.77	3.237707
CAR	49	22.70507	2.6905	17.4104	27.75
INFLATION	49	3.90441	1.890599	1.33257	8.359133
GDP	49	4.453387	2.338396	-5.32442	7.077696

Based on the descriptive statistics in table 1 above from 49 observations for the position of Q3-2012 to Q3-2024, the results are obtained that the average profitability of commercial banks in Indonesia is 2.52% with a minimum value of 1.59% and a maximum value of 3.11%. The value distribution of the average profitability is 0.377%. This shows that in our observation, the average commercial bank in Indonesia has a risk of 0.377% in achieving profits compared to bank assets that deviate from the average.

For the BOPO variable as one of the representations of the measurement of operational risk in banks, an average result of 79.76% was obtained with a minimum value of 74.08% and a maximum value of 88.84%. The minimum and maximum values are still in the range of the bank's BOPO value, which is quite ideal where the amount of the bank's operational expenses

is still lower than its operating income. In addition, the level of variation or fluctuation of bank BOPO is at a moderate level, which is 3.53%.

For the variable Efficiency\_Ratio as another indicator that represents the measurement of operational risk in banks, an average result of 4.18% was obtained with a minimum value of 1.5% and a maximum value of 7.56%. The level of variation or fluctuation in bank operational efficiency is 1.73%.

**Correlation Coefficients**

**Table 2. Model 1 Correlation Matrix**

	ROA	Efficiency _Ratio	Asset_ yoy	NIML1	LDRL1	NPL	CAR	Inflati on	GDP
ROA	1.000								
Efficiency _Ratio	-0.2945	1.000							
Asset_yoy	0.576	-0.2325	1.000						
NIML1	0.2383	-0.0171	0.1128	1.000					
LDRL1	0.1253	-0.0289	0.0042	0.2421	1.000				
NPL	-0.882	0.0853	-0.6346	-0.1128	-0.04	1.000			
CAR	-0.4106	0.2352	-0.7589	-0.2721	-0.3907	0.4293	1.000		
Inflation	0.6047	-0.2275	0.7418	0.1509	0.0802	-0.5805	-0.6283	1.000	
GDP	0.5716	-0.117	0.3176	0.4177	-0.0808	-0.4161	-0.0894	0.362	1.000

Table 2 is a correlation table between independent variables of model 1. In the table, there are no variables that have a correlation of more than 80% with other variables. This will minimize the multicollinearity effect of the time series model used. The largest correlation was found in the CAR variable and the annual asset growth variable (asset\_yoy) which was 75.89%, while the smallest correlation was found in the LDRL1 variable and the Asset\_yoy variable which was 0.42%.

**Table 3. Model 2 Correlation Matrix**

	ROA	Efficiency _Ratio	Asset_ yoy	NIML1	LDRL1	NPL	CAR	Inflati on	GDP
ROA	1.000								
Efficiency _Ratio	-0.2945	1.000							
Asset_yoy	0.576	-0.2325	1.000						
NIML1	0.2383	-0.0171	0.1128	1.000					
LDRL1	0.1253	-0.0289	0.0042	0.2421	1.000				
NPL	-0.882	0.0853	-0.6346	-0.1128	-0.04	1.000			
CAR	-0.4106	0.2352	-0.7589	-0.2721	-0.3907	0.4293	1.000		
Inflation	0.6047	-0.2275	0.7418	0.1509	0.0802	-0.5805	-0.6283	1.000	
GDP	0.5716	-0.117	0.3176	0.4177	-0.0808	-0.4161	-0.0894	0.362	1.000

Table 3 is a correlation table between independent variables of model 2. In the table, there are no independent variables that have a correlation of more than 80% with other independent variables. This will minimize the multicollinearity effect of the time series model used. The largest correlation was found in the BOPO variable and the NPL variable which was 77.5%, while the smallest correlation was found in the LDRL1 variable and the Asset\_yoy variable which was 0.42%.

### Regression Analysis

The following are the results of the regression analysis for model 1 and model 2:

**Table 4 Regression Analysis Model 1**

Adj R-Squared	<b>0,8641</b>			
Prob > F	0,0000			
Root MSE	0,13679			
ROA	<b>Coeff</b>	<b>Std. Error</b>	<b>t</b>	<b>p&gt; t </b>
Efficiency_Ratio	-0,0436654	0,0119248	-3,66	0,001
Asset_yoy	-0,0075958	0,0128949	-0,59	0,559
NIML1	0,0381243	0,0588305	0,65	0,521
LDRL1	0,0081852	0,0051397	1,59	0,119
NPL	-0,7128541	0,0687247	-10,37	0,000
CAR	0,0079924	0,0164502	0,49	0,63
Inflation	0,0203936	0,0165806	1,23	0,226
GDP	0,0321262	0,0114753	2,8	0,008
_Cons	3,300481	0,933084	3,54	0,001

The regression results of the analysis for model 1 obtained good goodness of fit, as reflected by the significant Prob>F below 5%. This shows that all independent variables simultaneously provide a causal relationship to the dependent variable. In addition, the adjusted R-squared value was recorded quite high, which was 86.41%. This shows that all independent variables used are quite good in describing the movement/characteristics of dependent variables.

Individually, in model 1, the E variable *efficiency\_ratio* has a negative and significant impact on the ROA of commercial banks in Indonesia. A 1% increase in variable *Efficiency\_ratio* reduce the ROA of commercial banks by 0.04%. This is because the bank's operational expenses can reduce the bank's profit and affect ROA. Another significant variable that has an impact on the ROA of commercial banks in Indonesia is NPL and GDP.

**Table 5. Model Regression Analysis 2**

Adj R-Squared	<b>0,8508</b>			
Prob > F	0,0000			
Root MSE	0,14331			
ROA	<b>Coeff</b>	<b>Std. Error</b>	<b>t</b>	<b>p&gt; t </b>
BOPO	-0,03335	0,011277	-2,96	0,005
Asset_yoy	-0,009032	0,013531	-0,67	0,508
NIML1	0,0041015	0,061605	0,07	0,947
LDRL1	0,010371	0,005453	1,9	0,065

NPL	-0,52628	0,089419	-5,89	0,000
CAR	-0,000483	0,017141	-0,03	0,978
Inflation	0,0156707	0,017589	0,89	0,378
GDP	0,0245009	0,012665	1,93	0,06
_Cons	5,536545	1240645	4,46	0,000

The regression results of the analysis for model 2 obtained good goodness of fit, as reflected by the significant Prob>F below 5%. This shows that all independent variables simultaneously provide a causal relationship to the dependent variable. In addition, the adjusted R-squared value was recorded quite high, which was 85.08%. This shows that all independent variables used are quite good in describing the movement/characteristics of dependent variables.

Individually, in model 2, the BOPO variable has a negative and significant impact on the ROA of commercial banks in Indonesia. A 1% increase in the BOPO variable decreased the ROA of commercial banks by 0.03%. This is because the bank's operational expenses can reduce the bank's profit and affect ROA. Another significant variable that has an impact on the ROA of commercial banks in Indonesia is NPL.

Based on the hypothesis testing carried out, this study provides results that operational risk as measured through Operating Costs to Operating Income (BOPO) and Efficiency Ratio, has a significant relationship with profitability measured by ROA in commercial banks in Indonesia.

The test results showed that the main hypothesis ( $H_0$ ) was rejected, indicating a significant relationship between operational risk and profitability. The first sub-hypothesis ( $H_{01}$ ) stating the absence of a significant relationship between ROA and Efficiency Ratio was also rejected, confirming that Efficiency Ratio has a significant influence and negative correlation with bank profitability as evidenced by Qabajeh (2023). The second sub-hypothesis ( $H_{02}$ ), which states the absence of a significant relationship between ROA and BOPO, is also rejected, suggesting that BOPO has a significant relationship and a negative correlation with bank profitability as Hasan (2020) researched. A high BOPO ratio reflects high operating costs that reduce the bank's efficiency and profitability, while the Efficiency Ratio indicates that inefficient asset management can also reduce the bank's financial performance (Batten & Vo, 2019).

## CONCLUSION

The results of this study confirm that operational efficiency is a fundamental factor in mitigating operational risks and increasing bank profitability. Inefficiencies in cost and asset management not only harm financial stability, but also have a significant impact on banks' competitiveness. Who emphasized the importance of more comprehensive risk management to improve operational efficiency and financial performance. In addition, the study also underscores the need to pay attention to operational risk indicators as one of the main measures of a bank's financial health, who found that operational efficiency is a key determinant of bank profitability in emerging markets.

This research makes a significant contribution to the academic literature and practitioners by highlighting the importance of effective operational risk management strategies. Banks and regulators are advised to adopt policies that support optimal management of operational costs and asset efficiency as a risk mitigation measure. In addition, these results support

recommendations to strengthen a more integrated risk management framework, in the context of Indonesian banking. Future research may explore other dimensions of risk or expand geographic coverage to strengthen understanding of the relationship between operational risk and profitability in the global banking sector.

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