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# Effects of Third-Party Funds, Credit Risk, Firm Size, and Operational Efficiency on Profitability of Listed Banks in Indonesia, 2020–2024

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## **Abstract**

This study analyzes the effect of third-party funds (DPK), credit risk, firm size, and operational efficiency on bank profitability. Profitability is measured by return on assets (ROA), while credit risk and operational efficiency are proxied by the non-performing loan ratio (NPL) and operating expenses to operating income (BOPO), respectively. The study uses a quantitative approach with secondary data from the annual financial reports of banks listed on the Indonesia Stock Exchange during 2020–2024. The sample consists of 29 banks selected by purposive sampling, giving 145 firm-year observations. Data were analyzed with descriptive statistics, classical assumption tests, multiple linear regression, the t-test, the F-test, and adjusted  $R^2$ . The results show that DPK has a negative and significant effect on ROA, credit risk has no significant effect, firm size has a positive and significant effect, and operational efficiency (BOPO) has a negative and significant effect. Simultaneously, the four variables significantly affect profitability. The adjusted  $R^2$  of 47.8% indicates that the model explains 47.8% of the variation in profitability, while the remaining 52.2% is explained by factors outside the model.

**Keywords :** *Banking; Third-Party Funds; Credit Risk; Firm Size; Operational Efficiency; Profitability*

## I. INTRODUCTION

The banking industry plays an important role in maintaining economic stability through its intermediation function, that is, collecting public funds and channeling them back as loans and financing. Because banks manage large amounts of public funds, they face various risks, including credit risk, operating cost pressure, and market uncertainty. Profitability is therefore an important indicator of how successfully a bank manages its assets and resources. In this study profitability is measured by return on assets (ROA), because ROA describes a bank's ability to generate profit from the assets it manages.

Bank profitability during 2020–2024 fluctuated (Fig. 2). The average ROA of the banking sector was 0.068% in 2020, fell to –0.402% in 2021, then rose to 0.564% in 2022, 0.903% in 2023, and 0.949% in 2024. These fluctuations show that the improvement in profitability has not been stable and is still affected by funds management, loan quality, business scale, and operational efficiency.

Third-party funds (DPK) are a bank's main source of funding, coming from demand deposits, savings, and time deposits. How effectively DPK is managed determines the bank's ability to channel funds to productive assets and ultimately affects profit. Credit risk is proxied here by the non-performing loan ratio (NPL): the higher the NPL, the larger the problem loans and the potential loss. Firm size is proxied by the natural logarithm of total assets, and operational efficiency is measured by BOPO, where a higher BOPO indicates lower efficiency because operating expenses are relatively larger than operating income.

Previous studies show inconsistent results. DPK has been reported to have a negative effect in some studies and no significant effect in others. Credit risk also shows mixed results, being positive and significant, negative and significant, or not significant. Similar inconsistency exists for firm size and operational efficiency. This study addresses the research gap by testing the four variables in one model over 2020–2024, a period that covers economic pressure, recovery, and stabilization of the banking sector. The objective is to analyze the effect of DPK, credit risk, firm size, and operational efficiency on bank profitability, both partially and simultaneously.

### A. Literature Review and Hypotheses

*Agency theory.* Agency theory explains the contractual relationship between principal and agent (Jensen & Meckling, 1976). In banking, management acts as the agent that manages public funds and company resources, so oversight and management aligned with the owners' interests are needed. Cost efficiency, risk management, and optimal use of funds are important in reducing agency conflict and improving firm performance.

*Resource-based theory (RBT).* RBT views a firm as a collection of resources and capabilities that can be managed to create competitive advantage (Barney, 1991). In banking, DPK is a financial resource, firm size represents the scale of resources, and the ability to manage risk and operational efficiency reflects managerial capability. Integrated management of resources is expected to raise profitability.

*Signaling theory.* Signaling theory (Spence, 1973) concerns conveying information about a firm's condition to its users. Firms can use signals in their financial statements to inform parties who need financial data to understand the firm's performance and prospects (Fitriani & Maharani, 2024).

*Variables.* Profitability is a firm's ability to generate profit; ROA is used because it shows how well a bank manages total assets to generate profit. DPK is the sum of demand deposits, savings, and time deposits. NPL is problem loans divided by total loans extended. Firm size is  $\ln(\text{total assets})$ , and BOPO is operating expenses divided by operating income (Table II).

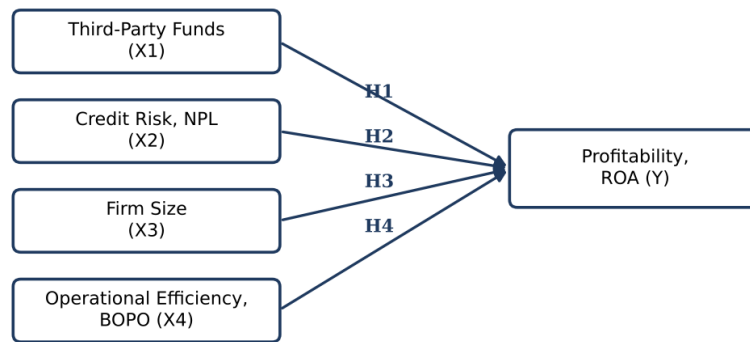


**Fig. 1. Conceptual framework.**

Based on the theories and the research gap above, the hypotheses are:  $H_1$ , DPK affects profitability;  $H_2$ , credit risk (NPL) affects profitability;  $H_3$ , firm size affects profitability;  $H_4$ , operational efficiency (BOPO) affects profitability; and  $H_5$ , DPK, NPL, firm size, and BOPO simultaneously affect profitability.

## II. METHOD

This study uses a quantitative approach. The population is the banking companies listed on the Indonesia Stock Exchange during 2020–2024. Of 47 banks, 14 were excluded because they were not listed before 2020 or conducted an IPO after 2020 and/or had incomplete or inconsistent financial statements, and 4 sharia-based banks were also excluded. This leaves 29 banks, so the total number of observations over five years is 145 (Table I).

TABLE I. SAMPLE SELECTION

| Criterion                                                                                      | Banks |
|------------------------------------------------------------------------------------------------|-------|
| Banks listed on the IDX (population)                                                           | 47    |
| Not listed before 2020, IPO after 2020, and/or incomplete or inconsistent financial statements | (14)  |
| Sharia-based banks                                                                             | (4)   |
| Final sample                                                                                   | 29    |
| Firm-year observations (29 × 5 years)                                                          | 145   |

Source: IDX and company annual reports (2020–2024).

The data are secondary data from the annual financial reports of the banks for 2020–2024, collected from the Indonesia Stock Exchange and each company's official website. The analysis techniques are descriptive statistics, classical assumption tests, multiple linear regression, the  $t$ -test, the  $F$ -test, and the coefficient of determination. The data were winsorized and transformed by natural logarithm at the model-testing stage. The Glejser test shows all significance values above 0.05, so the model is free of heteroscedasticity. The autocorrelation test gives a Durbin–Watson statistic of 1.943, so there is no autocorrelation.

TABLE II. VARIABLE DEFINITIONS

| Variable                    | Proxy | Measurement                               |
|-----------------------------|-------|-------------------------------------------|
| Profitability (Y)           | ROA   | Profit relative to total assets           |
| Third-party funds (X1)      | DPK   | Demand deposits + savings + time deposits |
| Credit risk (X2)            | NPL   | Problem loans / total loans               |
| Firm size (X3)              | SIZE  | Ln(total assets)                          |
| Operational efficiency (X4) | BOPO  | Operating expenses / operating income     |

Source: compiled by the authors.

### III. RESULTS AND DISCUSSION

#### A. Descriptive Statistics

Table III shows that the average ROA is 0.7981%, so profitability in the sample is relatively low but positive. The average NPL is 2.8247%, the average BOPO is 92.3031%, and the average SIZE is 18.0104. The data show considerable variation among banks during the observation period.

TABLE III. DESCRIPTIVE STATISTICS

| Variable | N   | Minimum   | Maximum       | Mean           | Std. Deviation  |
|----------|-----|-----------|---------------|----------------|-----------------|
| ROA      | 145 | -0.1959   | 0.0389        | 0.007981       | 0.0202259       |
| DPK      | 145 | 2,054,170 | 1,446,234,957 | 200,318,732.17 | 364,367,510.341 |
| NPL      | 145 | 0.06      | 11.34         | 2.8247         | 1.80765         |
| SIZE     | 145 | 15.13     | 21.61         | 18.0104        | 1.71124         |
| BOPO     | 145 | 31.11     | 287.86        | 92.3031        | 35.86638        |

Source: SPSS output (processed by the authors, 2026).

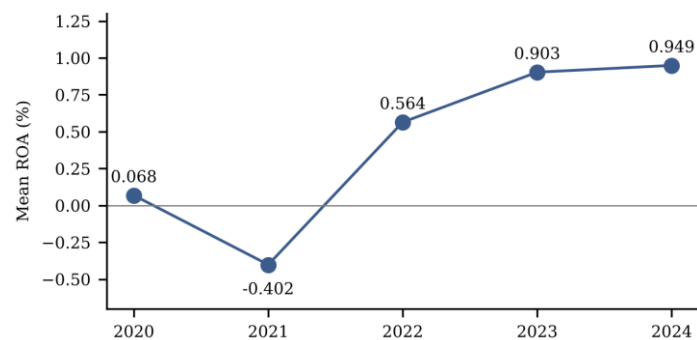


Fig. 2. Average ROA of the banking sector, 2020-2024 (%).

#### B. Regression Results and Hypothesis Tests

TABLE IV. MULTIPLE LINEAR REGRESSION AND T-TEST RESULTS

| Variable | B       | Std. Error | Beta   | t      | Sig.  |
|----------|---------|------------|--------|--------|-------|
| Constant | -59.075 | 12.817     | —      | -4.609 | 0.000 |
| DPK      | -1.063  | 0.346      | -1.776 | -3.073 | 0.003 |
| NPL      | -0.147  | 0.079      | -0.118 | -1.870 | 0.064 |
| SIZE     | 27.150  | 6.508      | 2.405  | 4.172  | 0.000 |
| BOPO     | -1.223  | 0.217      | -0.361 | -5.623 | 0.000 |

Source: SPSS output (2026). Dependent variable: ROA.  $t$ -table = 1.977.

*Third-party funds.* DPK has a coefficient of  $-1.063$ ,  $t = -3.073$ , and  $\text{Sig.} = 0.003$ . Because  $|t|$  exceeds the  $t$ -table value of 1.977 and the significance is below 0.05, DPK has a negative and significant effect on ROA ( $H_1$  accepted). An increase in DPK does not automatically raise profit if the funds collected are not channeled optimally to productive assets; the bank still bears the cost of funds, so large DPK without effective management and channeling can depress profitability. This is in line with Shabiha et al. (2025) and Saputri and Nursamsiyah (2025) but differs from Putri et al. (2025) and Sondakh et al. (2021). It reinforces RBT: the size of a resource is not enough without effective management capability.

*Credit risk.* NPL has a coefficient of  $-0.147$ ,  $t = -1.870$ , and  $\text{Sig.} = 0.064$ . Because the significance exceeds 0.05, credit risk has no significant effect on ROA ( $H_2$  rejected). The negative sign suggests that a higher NPL tends to depress ROA, but the effect is not statistically strong enough. This may occur because banks can still contain the impact of problem loans through loan-loss reserves, loan restructuring, and risk management.

*Firm size.* SIZE has a coefficient of  $27.150$ ,  $t = 4.172$ , and  $\text{Sig.} = 0.000$ , so firm size has a positive and significant effect on ROA ( $H_3$  accepted). Banks with larger assets tend to have more resources, a wider network, better access to funding, and greater operating capacity, which creates larger income opportunities. This supports Fitriatun and Meirini (2024) and Riyana et al. (2024) and strengthens the RBT view that the scale of resources can be a basis for superior performance.

*Operational efficiency.* BOPO has a coefficient of  $-1.223$ ,  $t = -5.623$ , and  $\text{Sig.} = 0.000$ , so operational efficiency has a negative and significant effect on ROA ( $H_4$  accepted). A high BOPO means operating expenses are large relative to

operating income, so a higher BOPO depresses profit and ROA. This is consistent with Putri et al. (2025), who found that BOPO negatively affects profitability.

TABLE V. SIMULTANEOUS TEST AND MODEL DIAGNOSTICS

| Statistic                    | Value       |
|------------------------------|-------------|
| F-statistic                  | 31.731      |
| Sig. (F)                     | 0.000       |
| Adjusted R <sup>2</sup>      | 0.478       |
| Durbin-Watson                | 1.943       |
| Glejser test (all variables) | Sig. > 0.05 |

Source: SPSS output (2026).

*Simultaneous effect.* The *F*-test gives  $F = 31.731$  with  $\text{Sig.} = 0.000$ , so DPK, NPL, SIZE, and BOPO simultaneously affect ROA ( $H_5$  accepted). The adjusted  $R^2$  of 47.8% shows that the four variables explain 47.8% of the variation in profitability, while 52.2% is explained by other factors outside the model. Bank profitability is thus the result of the interaction of financial resources, loan quality, business scale, and operational efficiency, so improving it requires integrated resource management rather than a single policy.

TABLE VI. SUMMARY OF HYPOTHESIS TESTING

| Hypothesis                                    | Sig.  | Result   |
|-----------------------------------------------|-------|----------|
| H1: DPK → ROA (negative)                      | 0.003 | Accepted |
| H2: NPL → ROA                                 | 0.064 | Rejected |
| H3: SIZE → ROA (positive)                     | 0.000 | Accepted |
| H4: BOPO → ROA (negative)                     | 0.000 | Accepted |
| H5: DPK, NPL, SIZE, BOPO → ROA (simultaneous) | 0.000 | Accepted |

Source: SPSS output (2026).

*Implications.* From the agency perspective, the negative effect of BOPO and the non-significant effect of NPL show that management's cost control matters more for profit than the loan-quality indicator in this sample, since cost discipline directly reduces the gap between management's actions and owners' interest in profit. From the RBT perspective, firm size is a resource that raises profitability, whereas DPK, a financial resource, lowers it unless it is converted effectively into productive assets, so capability rather than resource volume drives performance. From the signaling perspective, DPK, firm size, and BOPO reported in financial statements carry information that investors can use alongside macroeconomic and regulatory conditions.

*Limitations.* The study covers listed conventional banks over five years, a period shaped by the pandemic and its recovery, and uses four predictors, so more than half of the variation in ROA remains unexplained. The data were winsorized and log-transformed at the model stage, so the coefficients should be interpreted in the transformed units. Results may differ for other bank groups, such as sharia banks, or for other periods.

#### IV. CONCLUSIONS

DPK has a negative and significant effect on profitability (ROA), credit risk has no significant effect, firm size has a positive and significant effect, and operational efficiency, proxied by BOPO, has a negative and significant effect. Simultaneously, DPK, NPL, SIZE, and BOPO significantly affect profitability. Banks should direct DPK management toward optimal channeling to loans and productive assets rather than only pursuing fund growth, maintain loan quality, optimize assets, and reduce operating costs through technology and cost control. For investors, DPK, firm size, and BOPO can serve as additional indicators of bank performance, alongside economic conditions, monetary policy, and regulation. Future research may add CAR, LDR/FDR, NIM, GCG, inflation, and interest rates, and extend the observation period.

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