

# Banks' Core Deposits and Net Interest Margin: Do Size and Ownership Structure Matter?

Iman Sofian Suriawinata, Doddi Prastuti, Pristina Hermastuti

STIE Indonesia Jakarta  
Jl. Kayu Jati Raya 11A, Rawamangun, Jakarta, 13220, Indonesia.

---

**Article history:**

Received: 2022-12-16

Revised: 2023-12-10

Accepted: 2023-06-17

---

✉ Corresponding Author:

**Iman Sofian Suriawinata**

E-mail: iman.suriawinata@stei.ac.id

## Abstract

Banks' core deposits and net interest margins play important roles in the banks' value creation process. This study examines the effects of bank size and ownership structure on banks' core deposits and net interest margins. The mediating role of core deposits funding on the relationship among variables being studied is also explored. Applying a structural equation modeling approach on panel data consisting of 39 conventional banks listed on the Indonesian Stock Exchange during 2016-2020, this study documents several important findings. Firstly, core deposits fundings positively affect banks' net interest margins. Secondly, bank size has a positive effect on banks' core deposits fundings, and has a positive indirect as well as total effect on net interest margin. Thirdly, managerial and institutional ownerships have negative effects on core deposits, positive direct effects on bank net interest margin, but negative indirect effects on bank net interest margin. Lastly, the positive direct effects of managerial and institutional ownership on bank net interest margin are totally offset by the negative indirect effects brought on net interest margin (NIM) through core deposits.

**Keywords** : Bank size, Core deposits, Mediation, Net interest margin, Ownership structure

**JEL Classification** : C12, C33, G21

This is an open-access article under the [CC-BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license



## 1. Introduction

As a financial intermediary company, the traditional role of a conventional banking firm is to collect funds from depositors, and then extend those funds in the form of credits to borrowers or invest in other forms of interest-earning assets, such as corporate or government bonds. There are three main sources of funding available for a bank to finance its investments in credits or other interest-earning assets, i.e.: (i) deposit funding, (ii) wholesale funding, and (iii) equity funding. As a reward for providing financial intermediation services, i.e. taking deposits and extending loans or buying earnings assets, the bank receives a net interest margin, which is calculated as the difference between a bank's interest income and interest expense relative to the amount of the total interest-earning assets. The bank net interest margin (NIM) is important for the banking firm because it is used to cover the bank's non-interest expenses, such as: salaries and benefits, marketing and promotion, office supplies, fixed-asset depreciation, utilities, as well as provisions for loan losses. NIM also reflects a bank's profitability and growth, and it shows how much the bank is earning interest income from the loans extended compared to the interest paid on the deposits received.

Despite the rising importance of non-interest income as a proportion of total bank income, the net interest margin remains the principal and significant component of banks' total revenue and net income. Data from our samples reveal that the proportion of non-interest income-to-total revenue increased from an average of 9.06% in 2016 to 13.29% in 2020. During the same period, the average percentage of the net interest income (interest income minus interest expense) to the total bank revenue is 41.8%, though it has declined from 43.6% in 2016 to 37.9% in 2020 due to a decline in the NIM itself from 6.84% in 2016 to 5.30% in 2020. Nevertheless, during our sample period, on average, the amount of net interest income is 6.81 times as large as the non-interest income, indicating that net interest income remains the major contributor to banks' revenue and net income.

Many previous studies have examined the determinants of banks' net interest margins (NIM). For example, by applying the dealership model of Ho & Saunders (1981), Saunders et al. (2000) find that segmented banking systems, interest-rate volatility, interest-rate restrictions on deposits, reserve requirements, and capital-to-asset ratios are important determinants of banks' NIM. Using a set of macroeconomic variables from 15 developed and emerging economies, López-Espinosa et al. (2011) find that interest-rate volatility and inflation positively and significantly affect the dynamics of NIM. In addition to using the macroeconomic and the banking industry-related environment variables, other studies employ bank-level characteristics, and find that the following factors significantly affect banks' NIM, i.e. (i) capital-to-asset ratio (Saunders et al., 2000; Williams, 2007; Chortareas et al., 2012; Claessens et al., 2018; Angori et al., 2019; Khan & Jalil, 2020; Lestari et al., 2021), (ii) operating costs-to-total assets (Williams, 2007; Hawtrey & Liang, 2008; Entrop et al., 2015; Birchwood et al., 2017; Angori et al., 2019; Khan & Jalil, 2020), (iii) bank size (Ganić, 2018; Khan & Jalil, 2020), (iv) credit risk (Williams, 2007; Hawtrey & Liang, 2008; Chortareas et al., 2012; Entrop et al., 2015; Busch & Memmel, 2016; Birchwood et al., 2017; Ganić, 2018; Angori et al., 2019; Khan & Jalil, 2020; Lestari et al., 2021), and (v) loan-to-deposit ratio (Islam & Nishiyama, 2016; Lestari et al., 2021).

Another important bank-level factor that determines the magnitude of a bank's NIM is its funding composition (Choudhry, 2018), including bank deposit composition. Among the three sources of bank funding mentioned in the first paragraph, deposit funding is the cheapest source of funds, followed by wholesale funding, and obviously, equity funding is the most expensive. There are three types of deposits received by banks, i.e. current account or demand deposits, savings deposits, and term deposits. Anecdotal evidence shows that banks rely on current and savings accounts, also known as core deposits, as cheap sources of funds to earn larger net interest margins. Core deposits are deposits that act as a bank's long-term sources of funds (Saunders et al., 2021), and typically they are regarded as the most stable and least costly sources of funding for banks (Ben Naceur et al., 2018). Furthermore, a study by Sääskilahti (2018) shows that both the proportion of current accounts-to-total deposits as well as the proportion of savings accounts-to-total deposits have positive and significant effects on banks' net interest margins.

Using bank-level data from the conventional banking firms listed on the Indonesia Stock Exchange from 2016 to 2020, this study examines factors affecting banks' net interest margins. Inspired by the results of Sääskilahti (2018), our study also explores the effects of banks' deposit composition, i.e. proportion of core deposits on the bank's net interest margins. However, we extend our analysis by investigating whether banks' size and ownership structure play important roles in affecting banks' core deposits funding as well as banks' net interest margins mediated by the core deposits funding. We also include credit risk and operating costs as control variables in our analysis. Studying factors affecting banks' core deposits and net interest margin is important because previous empirical studies have shown that they both play significant roles in the banks' value creation process (e.g. Simoens & Vennet, 2021; Suriawinata, 2023).

By applying a structural equation model approach, our study finds three important results. Firstly, bank size and ownership structure significantly affect banks' core deposit funding. Secondly, banks' core deposits funding fully mediates the effects of bank size on banks' net interest margins. And thirdly, banks' core deposits funding partially mediates the effect of ownership structure on banks' net interest margins. To the best of our knowledge, this study is the first that examines the relationships among bank size, ownership structure, core deposits funding, and net interest margin using a structural equation modeling approach.

## 2. Hypotheses Development

### Bank Size, Ownership Structure, and Core Deposits Funding

In conducting their financial intermediation role, banks receive deposits and invest in loans and securities that generate interest income that shall be used to pay interest to depositors, and banks earned the difference between interest received and interest paid, the difference is known as the net interest margin (NIM). For banks, deposit funding has lower costs of funds compared to wholesale funding. Therefore, in order to maximize net interest margins and profits, banks rely on and need to mobilize deposits. Data from our samples show that the average proportion of bank deposits to total assets during the periods of 2016 to 2020 is 72.6%, and this number confirms the significant role of deposits as banks' source of funds in carrying out their banking businesses.

In competing for deposits, banks embark on various strategies, such as setting competitive deposit rates, increasing the number of branches, adopting mobile and e-banking technologies, and increasing customer service. Several studies have shown that banks' deposit mobilization also depends on macroeconomic variables, such as market interest rate, gross domestic product, inflation, and money supply (e.g. Yakubu & Abokor, 2020; Banke & Yitayaw, 2022; Winarto et al., 2022) as well as bank-level characteristics, such as profitability, size, capitalization, and liquidity (e.g. Ünvan & Yakubu, 2020; Thao & Than, 2021; Çekrezi, 2022).

As mentioned above, there are three main categories of deposit products offered by banks, i.e. demand deposits, savings deposits, and term deposits. According to Ünvan & Yakubu (2020), each deposit product serves different purposes for bank customers. Demand deposit accounts are used for transaction purposes, either for household expenditures or for business transactions. Savings deposit accounts are used for precautionary as well as speculative transactions, that is setting aside funds for reserve, fulfilling emergency needs, or exploiting short-window investment opportunities. These two categories of deposits are regarded as insensitive to changes in deposit rates (Driscoll & Judson, 2013; Duquerroy et al., 2021), because bank customers hold those accounts for facilitating their liquidity needs, either for daily transactions, fund reserve, or speculative purposes. Term or time deposit accounts, on the other hand, are used by bank customers for investment purposes, and therefore interest rates for term deposits are important for such bank customers who pursue maximum returns from their investments in term or time deposits.

In the banking literature, demand deposits and savings deposits are classified as core deposits that are deemed to be more stable compared to other types of funding sources, and they also impose lower costs of funds on banks (Ben Naceur et al., 2018; Saunders et al., 2021). This study asserts that the relationship between bank size and core deposits can be explained by deposit customers' perspectives on banks' reputations and risk. Large banks are regarded to be more reputable in serving customer needs compared to their smaller counterparts because large banks usually have a large number of branches across the country as well as better banking technology for serving bank customers' transaction or liquidity needs. Additionally, previous studies also show that large banks are less risky compared to smaller banks (Bhagat et al., 2015; Jabra et al., 2017; Ali & Pua, 2018) because larger banks have larger amounts of capital to absorb future losses, as well as they enjoy some sort of government guarantees related to the idea of "too-big-too-fail" for systematically important large banks (Tsafack et al., 2021). Survey studies by Nienaber et al. (2014) and (Vuong et al. (2020) also reveal that banks' reputation, service quality, and "peace of mind" are important factors relating to banking accounts services. Therefore, it can be concluded that individual and corporate customers who have transaction needs across the country and are risk-averse will choose larger banks when opening demand deposit or saving deposit accounts.

Concerning the relationship between ownership structure and bank deposit funding, this study also uses bank risk-taking behavior to explain the relationship between the two. Studies by Saunders et al. (1990), Barry et al. (2011), Hammami & Boubaker (2015), Amor (2017), and Ehsan & Javid (2018) show that managerial ownership and institutional ownership are positively related to bank risk-taking. The theoretical explanations of these empirical findings can be provided by using; (i) the agency theory relating to the conflict of interests between shareholders (owner-manager and owner-institution) and creditors/bondholders (depositors) as articulated by Jensen & Meckling (1976), and

(ii) the asset substitution problem associated with the usage of debt by a firm as described by Myers (1977) and Gavish & Kalay (1983). The increase in managerial and institutional shareholdings will increase their managerial influence and voting power to direct bank deposits to be allocated to riskier loans that provide higher returns. To increase available deposit funds to be invested in riskier loans, banks with influential managerial and institutional ownerships will offer higher rates for term deposits. The net effect of these actions is a transfer of wealth from “deposit creditors” that provide demand and savings deposits to shareholders. Term deposit holders are compensated with a higher deposit rate, but demand and savings deposit holders get nothing in return for being exposed to riskier loans. This study asserts that based on the deposit market discipline mechanism (Arnold et al., 2016), demand and savings deposit holders will avoid putting their money in banks with higher managerial and institutional holdings, as such banks tend to invest in riskier loans. As a consequence, banks with a higher managerial and institutional ownership will have a lower proportion of core deposits, but a higher proportion of term deposits, in their deposit funding composition. Hasan & Tandelilin (2012) and Trinugroho et al. (2020) provide evidence that banking market discipline does exist in the Indonesian banking industry. Based on the above arguments and analyses, this study hypothesizes the followings:

H<sub>1</sub>: Bank size has a positive effect on core deposits.

H<sub>2</sub>: Managerial ownership has a negative effect on core deposits.

H<sub>3</sub>: Institutional ownership has a negative on core deposits.

### **Bank Size, Ownership Structure, and Net Interest Margin: The Mediating Role of Core Deposits Funding**

As mentioned above, banks’ net interest margins are affected by both macroeconomic variables and bank-level variables. This study focuses on the effect of some bank-level characteristics on banks’ net interest margins. According to Ganić (2018), bank-level characteristics that affect NIMs of individual banks, among others are: (i) the interest rates paid by banks to depositors, (ii) the overall quality of a loan portfolio that reflects the credit risk associated with the loan portfolio, and (iii) cost-effectiveness. Other studies, such as Hawtrey & Liang (2008), Zhou & Wong (2008), Fungáčová & Poghosyan (2011), Sidabalok & Viverita (2011), Amidu & Wolfe (2013), Khan & Jalil (2020), and Lestari et al. (2021) include economies of scale, measured by the natural logarithm of total assets or total loans, as an important bank-level characteristic that determines net interest margin. It is argued that large banks enjoy economies of scale in mobilizing loans as well as deposits with the net effect of having larger net interest margins compared to smaller banks. The ownership structure is also regarded to affect banks’ net interest margins (Williams, 2007; Fungáčová & Poghosyan, 2011; Birchwood et al., 2017), though the ownership types being investigated are related to foreign, state, and domestic ownerships. Lastly, as shown by Sääskilähti (2018), core deposits (i.e. demand deposits and savings deposits) also have a significant effect on banks’ net interest margin.

In the preceding section, we analyze and develop the hypothesized effects of bank size, managerial ownership, and institutional ownership on banks’ deposit composition. In this section, we extend our analysis by investigating the effects of the aforementioned variables on banks’ net interest margins, with core deposits funding as the mediating variable. The effect of bank size on banks’ net interest margins is transmitted through the benefits of economies of scale in mobilizing loans and deposits that positively affect the net interest margin. As explained in the preceding section, managerial ownership, and institutional ownership drive banks to invest in riskier loans, and therefore those types of ownership positively affect net interest margin. The effect of core deposits on a bank’s net interest margin is clear. As core deposits have a lower cost of funds, a larger proportion of core deposits to total deposits will have a positive effect on the bank’s net interest margin. Finally, since this study asserts that bank size and ownership structure affect both the deposit funding composition and the net interest margin, we extend our analysis by investigating whether bank deposit funding composition mediates the effects of bank size and ownership structure on a bank’s net interest margin.

Based on the above arguments and analyses, this study hypothesizes the followings:

H<sub>4</sub>: Core deposits have a positive effect on NIM.

H<sub>5</sub>: Bank size has a positive effect on NIM.

- H<sub>6</sub>: Managerial ownership has a positive effect on NIM.
- H<sub>7</sub>: Institutional ownership has a positive effect on NIM.
- H<sub>8</sub>: Core deposits mediate the effect of bank size on NIM.
- H<sub>9</sub>: Core deposits mediate the effect of managerial ownership on NIM.
- H<sub>10</sub>: Core deposits mediate the effect of institutional ownership on NIM.

Our study also includes credit risk and operating costs as control variables. Based on the cost components model of bank net interest margin determination (Busch & Memmel, 2016), the credit risk and operating costs are predicted to have positive effects on the bank net interest margin.

### 3. Method, Data, and Analysis

Employing a purposive sampling method, this study obtains a final sample of 195 observations, resulting from a panel of 39 conventional listed banking firms on the Indonesia Stock Exchange with 5-year observations for the period of 2016-2020. Our study employs a structural equation modeling approach in our panel regression analyses, which include: (i) net interest margin and the composition of deposit funding as endogenous variables, (ii) bank size, managerial ownership, and institutional ownership as exogenous independent variables; and (iii) credit risk and operating costs as exogenous control variables. The specifications of our empirical models are as follows:

$$CORE_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 MO_{it} + \beta_3 IO_{it} + \varepsilon_{it}$$

Where CORE represents the proportion of core deposits (the total of demand and savings deposits) to the total deposits. Bank size (SIZE) is proxied by the natural logarithm of the bank's total assets. To measure managerial ownership and institutional ownership, we use the percentage of managerial shareholdings (MO) and the percentage of institutional shareholdings (IO), respectively. Credit risk (CR) is proxied by the ratio of impairment losses to total loans, while operating cost (OC) is proxied by the total of non-interest operating expenses divided by the total assets.

### 4. Results

Table 1 exhibits descriptive statistics for the endogenous and exogenous variables. NIM has a mean value of 6.196%, which number is above the average NIMs of the banking industries within The ASEAN countries of 3,204% over the periods of 2016-2020 (source: www.theglobaleconomy.com). CORE has a mean value of 0.357 or 35.7% of the total deposits, with the lowest value of 19.0% and the highest value of 78.1%. The average percentage of managerial ownership (MO) is 2.7%, while the average percentage of institutional ownership (IO) is 74.7%. The average bank size during the entire study period is Rp. 165.7 trillion, with the lowest value of Rp. 2.1 trillion and the highest value of Rp. 1,511.8 trillion. The average value of impairment losses to total loans (CR), which reflects credit risk, has a mean value of 0.018 or 1.8%. The ratio of non-interest expenses to total assets over the sample period is 0.032 or 3.2%.

**Table 1.** Descriptive Statistics

| Variable            | Obs | Mean   | Std. Dev. | Min    | Max    |
|---------------------|-----|--------|-----------|--------|--------|
| NIM                 | 195 | 6.196  | 2.648     | 0.303  | 14.405 |
| CORE                | 195 | 0.357  | 0.190     | 0.092  | 0.781  |
| MO                  | 195 | 2.722  | 9.134     | 0.000  | 77.780 |
| IO                  | 195 | 74.696 | 19.953    | 0.000  | 99.970 |
| SIZE (Rp. trillion) | 195 | 165.7  | 314.3     | 2.1    | 1,511  |
| CR                  | 195 | 0.018  | 0.028     | -0.065 | 0.271  |
| OC                  | 195 | 0.032  | 0.011     | 0.011  | 0.073  |

Data Processed, 2022

Table 2 reports the pair-wise correlations among the variables. CORE, SIZE, and OC have positive and significant (at the 1% level) correlations with NIM, meaning that a higher CORE, SIZE, or OC is associated with a higher NIM. However, MO has a negative and significant (at the 10% level) correlation with NIM. Both IO and MO have negative and significant correlations (at the 1% and 5% levels, respectively) with CORE, but SIZE has a positive and significant (at the 1% level) correlation

with CORE. Also, MO and OC have negative and significant (at the 1% and 10% levels, respectively) correlations with IO. On the other hand, CR has a positive and significant (at the 5% level) correlation with IO, which indicates that higher institutional ownership (IO) corresponds to higher credit risk (CR). Interestingly, SIZE and OC have negative and significant (at the 1% and 5% levels, respectively) correlations with MO, indicating that managerial ownership is associated with smaller banks and less operating costs. Lastly, OC and CR are positively and significantly (at the 10% level) correlated. Since none of the regressors has an absolute correlation value  $>0.8$ , it can be concluded that there is no multicollinearity problem in the data (Gujarati & Porter, 2009).

Detecting the problem of multicollinearity can also be conducted using the variance inflation factor (VIF). Table 3 shows that none of the regressors have a VIF score that exceeds the threshold value of 10 (Greene, 2018; Gujarati & Porter, 2009). Therefore, similar to the results of the pair-wise correlation statistics, it can be concluded that there is no multicollinearity problem.

**Table 2.** Pair-wise Correlations

| Variables | (1)      | (2)       | (3)       | (4)       | (5)    | (6)    | (7)   |
|-----------|----------|-----------|-----------|-----------|--------|--------|-------|
| (1) NIM   | 1.000    |           |           |           |        |        |       |
| (2) CORE  | 0.430*** | 1.000     |           |           |        |        |       |
| (3) IO    | -0.036   | -0.192*** | 1.000     |           |        |        |       |
| (4) MO    | -0.132*  | -0.173**  | -0.419*** | 1.000     |        |        |       |
| (5) SIZE  | 0.277*** | 0.665***  | -0.007    | -0.249*** | 1.000  |        |       |
| (6) CR    | 0.105    | -0.048    | 0.147**   | -0.108    | -0.001 | 1.000  |       |
| (7) OC    | 0.503*** | 0.064     | -0.115*   | -0.165**  | -0.039 | 0.126* | 1.000 |

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**Table 3.** Variance Inflation Factor

|          | VIF   | 1/VIF |
|----------|-------|-------|
| CORE     | 1.964 | 0.509 |
| SIZE     | 1.904 | 0.525 |
| MO       | 1.428 | 0.700 |
| IO       | 1.414 | 0.707 |
| OC       | 1.113 | 0.898 |
| CR       | 1.047 | 0.955 |
| Mean VIF | 1.478 | .     |

However, the results of the skewness and kurtosis normality test (D'Agostino & Belanger, 1990) and the Breusch-Pagan Lagrange Multiplier panel heteroscedasticity test (Greene, 2018) indicate that our data have the problems of non-normality and heteroskedasticity. Therefore, to account for these problems we estimate the structural model of equations (1) and (2) using the robust standard errors - formally known as the Huber-White estimator that does not require that the residuals follow a normal distribution and it is also robust to heteroskedasticity in the residuals.

The regression results of Equation (1) in Table 4 show that SIZE has a positive effect on core deposits (CORE) at the 1% level of significance, meaning that Hypothesis 1 which states bank size has a positive effect on core deposits is supported. MO and IO both have negative effects on core deposits (CORE) at the 1% level of significance, indicating that an increase in MO or IO of a bank, will decrease the bank's composition of core deposits (CORE) funding. Therefore, Hypothesis 2 and Hypothesis 3, which predict that managerial ownership (MO) and institutional ownership (IO) negatively affect core deposits funding (CORE) are both supported.

The regression results of Equation (2) show that core deposits (CORE) have a positive effect on bank net interest margin (NIM) at the 1% level of significance. This result supports Hypothesis 4 which states that core deposits (CORE) have a positive effect on net interest margin (NIM). On the other hand, since the p-value of SIZE is not significant (above 0.1 or 10%), it can be concluded that bank size (SIZE) does not affect the bank's net interest margin (NIM). Therefore, Hypothesis 5 is not supported.

Table 4 shows the results of the structural equation model using the robust standard errors; while Table 5 dan Table 6 show the decomposition of the indirect and total effects of the variables estimated using the structural equation model.

Both managerial ownership (MO) and institutional ownership (IO) have positive and significant (both at the 5% level) effects on bank net interest margin (NIM). These results indicate that Hypothesis 6 and Hypothesis 7 are supported. As predicted, both the effects of credit risk (CR) and non-interest operating expenses (OC) on banks' net interest margins (NIM) have positive directions. However, only non-interest operating expenses (OC) that has a statistically significant effect on banks' net interest margins (NIM). Table 5 reports the results of the indirect effects of bank size (SIZE), managerial ownership (MO), and institutional ownership (IO) on bank net interest margin (NIM) through the proportion of core deposits to the total deposits (CORE).

**Table 4.** Structural Equation Results Endogenous Variables: CORE and NIM

|                     | Coef.   | Robust Std.Err. | z       | P>z      |
|---------------------|---------|-----------------|---------|----------|
| <b>STRUCTURAL</b>   |         |                 |         |          |
| <b>CORE (Eq. 1)</b> |         |                 |         |          |
| SIZE                | 0.069   | 0.004           | 16.770  | 0.000*** |
| MO                  | -0.002  | 0.001           | -3.240  | 0.001*** |
| IO                  | -0.002  | 0.000           | -4.820  | 0.000*** |
| Constant            | -1.619  | 0.139           | -11.670 | 0.000*** |
| <b>NIM (Eq. 2)</b>  |         |                 |         |          |
| CORE                | 5.703   | 1.363           | 4.180   | 0.000*** |
| SIZE                | 0.073   | 0.130           | 0.560   | 0.577    |
| MO                  | 0.028   | 0.013           | 2.210   | 0.027**  |
| IO                  | 0.018   | 0.009           | 2.080   | 0.038**  |
| CR                  | 4.849   | 6.073           | 0.800   | 0.425    |
| OC                  | 125.620 | 19.317          | 6.500   | 0.000*** |
| Constant            | -3.602  | 3.937           | -0.920  | 0.360    |
| <b>R-Squared</b>    |         |                 |         |          |
| CORE                | 0.4877  |                 |         |          |
| NIM                 | 0.4802  |                 |         |          |
| Overall             | 0.6423  |                 |         |          |

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Data Processed, 2022

**Table 5.** Structural Equation Decomposition – Indirect Effects

|                   | Coef.   | Robust Std.Err. | z     | P>z      |
|-------------------|---------|-----------------|-------|----------|
| <b>STRUCTURAL</b> |         |                 |       |          |
| <b>NIM</b>        |         |                 |       |          |
| SIZE              | 0.3917  | 0.0987          | 3.97  | 0.000*** |
| MO                | -0.0135 | 0.0058          | -2.32 | 0.020**  |
| IO                | -0.0128 | 0.0043          | -3.01 | 0.003*** |

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Bank size (SIZE) has a positive and significant (at the 1%) indirect effect on bank net interest margin (NIM) through core deposits (CORE). Therefore, this finding supports Hypothesis 8. On the other hand, managerial ownership (MO) and institutional ownership (IO) have indirect negative and significant (at the 5% and 1% levels, respectively) effects on bank net interest margin (NIM) through core deposits (CORE). These findings support Hypothesis 9 and Hypothesis 10. To summarize, core deposits (CORE) fully mediate the effect of bank size (SIZE) on bank net interest margin (NIM), but partially mediates the effect of managerial ownership (MO) and institutional ownership (IO) on bank net interest margin (NIM).

Table 6 reports the total effects of bank size (SIZE), managerial ownership (MO), and institutional ownership (IO) on bank net interest margin (NIM). After taking into account the indirect

effects of the aforementioned independent variables (i.e. SIZE, MO, and IO) on bank net interest margin (NIM), the results show the total effect of bank size (SIZE) on bank net interest margin (NIM) is positive and significant at the 1% level. On the other hand, the total effects of managerial ownership (MO) and institutional ownership (IO) on bank net interest margin (NIM) are not statistically significant, as shown by the insignificant *p*-values of 0.280 and 0.546, respectively – which are above the significant level of 0.1 or 10%.

**Table 6.** Structural Equation Decomposition – Total Effects

|                   | Coef.   | Robust Std.Err. | z      | P>z      |
|-------------------|---------|-----------------|--------|----------|
| <b>STRUCTURAL</b> |         |                 |        |          |
| <b>CORE</b>       |         |                 |        |          |
| SIZE              | 0.069   | 0.004           | 16.770 | 0.000*** |
| MO                | -0.002  | 0.001           | -3.240 | 0.001*** |
| IO                | -0.002  | 0.000           | -4.820 | 0.000*** |
| <b>NIM</b>        |         |                 |        |          |
| CORE              | 5.703   | 1.363           | 4.180  | 0.000*** |
| SIZE              | 0.465   | 0.079           | 5.870  | 0.000*** |
| MO                | 0.142   | 0.013           | 1.080  | 0.280    |
| IO                | 0.005   | 0.008           | 0.600  | 0.546    |
| CR                | 4.849   | 6.073           | 0.800  | 0.425    |
| OC                | 125.620 | 19.317          | 6.500  | 0.000*** |

\*\*\* *p*<0.01, \*\* *p*<0.05, \* *p*<0.1

The Sobel-Goodman test (Goodman, 1960; Sobel, 1982; Sobel, 1986) can also be employed to test the mediation or indirect effects described above. However, the Sobel-Goodman test is known to have low statistical power, notably when there are problems of non-normality and heteroskedasticity as indicated by Ng & Lin (2016). It is recommended that the solution is to use bootstrapping to obtain more reliable standard errors and *p*-values (Preacher & Hayes, 2008; Zhao et al., 2010; Hayes, 2022). Table 7 reports the results of the indirect effects using the bootstrapping method, and it can be seen that the results indicate the same conclusion as those reported in Table 5.

**Table 7.** Bootstrap Results of Indirect Effects

|            | Observed Coef. | Bootstrap Std.Err. | z     | P>z      |
|------------|----------------|--------------------|-------|----------|
| <b>NIM</b> |                |                    |       |          |
| SIZE       | 0.3719         | 0.1020             | 3.64  | 0.000*** |
| MO         | -0.0204        | 0.0074             | -2.77 | 0.006*** |
| IO         | -0.0102        | 0.0048             | -2.12 | 0.034**  |

## 5. Discussion

The results of this study provide several interesting findings. Concerning the effect of bank size on core deposits (Hypothesis 1), this study finds a positive and statistically significant effect. Larger banks are deemed to be less risky compared to their smaller counterparts (Bhagat et al., 2015; Jabra et al., 2017; Ali & Pua, 2018; Tsafack et al., 2021), and therefore core deposits (demand and savings deposits) holders have a preference for putting their money in large banks. As a comparison, Ünvan & Yakubu (2020) find that bank size positively affects deposit mobilization; on the contrary, Thao & Than (2021) find bank size negatively affects deposit mobilization. It must be noted, however, that this study focuses solely on the composition of core deposits within the total deposits, while the previously mentioned studies examined the effect of bank size on total deposits as a whole, consisting of demand deposits, savings deposits, and term or time deposits.

This study finds that both managerial ownership (Hypothesis 2) and institutional ownership (Hypothesis 3) negatively and significantly affect banks' core deposits. These findings can be



explained using the agency theory of debt (Jensen & Meckling, 1976; Myers, 1977) and the associated asset substitution problem (Gavish & Kalay, 1983). Because banks are inherently highly leveraged, by exercising their managerial influence (in the case of managerial ownership) and voting power or right to control (in the case of institutional ownership), banks with larger MO or IO tend to invest in riskier loans. As theorized by the agency cost debt and the related asset substitution problem, highly leveraged firms (banks) have the economic incentive to substitute high-quality projects (loans) having low risk-low return profiles with low-quality projects (loans) having high-risk-high return profiles. If the riskier loan does not default, shareholders and managers get the benefits. However, if the riskier loan defaults, depositors and creditors expose to losses. Based on the preceding analyses, such banks will drive out the risk-averse demand and savings deposit-holders, and shall rely more on costly term or time deposits as well as wholesale funding to finance riskier loans that provide higher returns. To the best of our knowledge, there are no prior studies that investigate the effects of managerial ownership and institutional ownership on core deposits funding.

This study finds that core deposits positively and significantly affect banks' net interest margins (Hypothesis 4), and this finding is similar to that of Sääskilahti (2018) which shows that both the proportions of demand deposits and savings deposits to total deposits positively affect bank net interest margin. A higher proportion of core deposits in a bank's deposit structure will lower the overall bank's cost of funds, thus increasing the net interest margin.

We do not find a statistically significant direct effect of bank size on net interest margin (Hypothesis 5). Other studies find a negative effect of bank size on net interest margin, e.g. Hawtrey & Liang (2008), Ganić (2018), and Lestari et al. (2021). On the other hand, Claeys & Vennet (2008) find a positive relationship, while Angori et al. (2019) find no effect. A possible explanation relating to our finding is that in our model, the bank size effect is also transmitted through core deposits funding. As a consequence, the effect of bank size on net interest margin is analyzed directly, and indirectly through core deposits funding, and totally after taking into account both the direct and indirect effects. As explained later, bank size has a positive and significant indirect effect through core deposits funding as well as a positive and significant total effect on net interest margin.

We find positive and statistically significant effects of managerial ownership (Hypothesis 6) and institutional ownership (Hypothesis 7) on banks' net interest margins. In other words, banks with higher managerial and institutional ownership tend to have higher net interest margins. As explained before, banks with higher managerial ownership and institutional ownership tend to take more risk by investing in riskier loans that provide higher returns. Consequently, *ceteris paribus*, such banks will have higher net interest margins (NIM).

Although not part of the hypotheses being tested, the following discusses the effects of credit risk (CR) and operating costs (OC) on bank net interest margin (NIM). This study finds that credit risk (CR), as proxied by the ratio of impairment loss-to-total loans, does not have a significant effect on bank interest margin. This finding is similar to those of Chortareas et al. (2012), Islam & Nishiyama (2016), and Angori et al. (2019) who also find no significant relationship between credit risk and bank net interest margin. A plausible explanation regarding this finding is that banks use a risk-based pricing method when determining loan rates, and are ready to absorb any future expected credit losses. Though seems counter-intuitive, this might explain why the bank net interest margin is insensitive to credit risk found in this study. Other studies, however, find a positive relationship between credit risk and bank net interest margin, e.g. Hawtrey & Liang (2008), Entrop et al. (2015), and Ganić (2018). While Doliente (2005) and Lestari et al. (2021) find that credit risk negatively affects bank net interest margin.

With regard to operating costs, this study finds that operating costs (OC) positively and significantly affect a bank's net interest margin. This finding indicates that banks set their net interest margins after taking into account the expected non-interest expenses. This finding is similar to the findings of Hawtrey & Liang (2008), Entrop et al. (2015), and Khan & Jalil (2020). However, Ganić (2018) finds that operating costs negatively and significantly affect bank net interest margin. The results of this study show that core deposits funding mediates the effects of bank size (Hypothesis 8), managerial ownership (Hypothesis 9), and institutional ownership (Hypothesis 10) on banks' net interest margins. The following will explain the aforementioned results. Large banks are regarded as

relatively less risky compared to smaller banks, and therefore are capable of attracting more low-cost deposits from demand and savings account customers. As a consequence, bank size contributes positively to the net interest margin through larger core deposits funding that has the lowest cost of funds compared to those of time deposits and wholesale funding.

The risk-taking behavior of manager-owner and institution-owner that influences banks to invest in riskier loans has caused demand and savings account customers to divert their money to less risky banks. As a consequence, banks with larger managerial and institutional ownerships have to rely on and mobilize more expensive term deposits or other forms of third-party funding (e.g. wholesale funding) to finance risky loans. The net result is through fewer core deposits (but more expensive term deposits funding), managerial ownership (MO), and institutional ownership (IO) contribute negatively to banks' net interest margins. By taking into both the direct and indirect effects of the variables being studied, the following will explain the interesting findings relating to the total effects of bank size (SIZE), managerial ownership (MO), and institutional ownership (IO) on banks' net interest margins (NIM). As shown in Table 4, bank size (SIZE) has no significant direct effect on bank net interest margin (NIM). But through its statistically significant effect on core deposits, bank size (SIZE) has a positive and statistically significant indirect as well as total effects on bank net interest margin (NIM).

Conversely, Table 4 shows that both managerial ownership (MO) and institutional ownership (IO) have positive and statistically significant effects on bank net interest margin (NIM), but have negative and statistically significant effects on core deposits (CORE). Therefore, because managerial ownership (MO) and institutional ownership (IO) drive core deposits (CORE) downwards, they cause negative indirect effects on the bank's net interest margin through core deposits. The statistically insignificant total effects of managerial ownership (MO) and institutional ownership (IO) on bank net interest margin (NIM) indicate that their positive direct effects on bank net interest margin are totally offset by the negative indirect effects on net interest margin (NIM) brought through core deposits funding.

## **6. Conclusion, Limitations, and Suggestions**

### **Conclusion**

The results of this study point to several important findings. Firstly, core deposits fundings positively affect banks' net interest margins. Secondly, bank size has a positive effect on banks' core deposits fundings, and has a positive indirect as well as total effect on net interest margin. Thirdly, managerial and institutional ownerships have negative effects on core deposits, positive direct effects on bank net interest margin, but negative indirect effects on bank net interest margin. Lastly, the positive direct effects of managerial and institutional ownership on bank net interest margin are totally offset by the negative indirect effects brought on net interest margin (NIM) through core deposits. To conclude, core deposits funding play important role in maximizing a bank's net interest margin, and bank size attracts core deposits funding. Additionally, due to the risk-taking behavior of manager-owner and institution-owner, the net effects of managerial and institutional ownership on the bank net interest margin are statistically insignificant, after taking into account the negative indirect effects on the bank net interest margin brought through the negative effects of managerial and institutional ownerships on core deposits funding.

### **Suggestion and Limitation**

While there are many previous studies relating to the determinants of bank net interest margin, to the best of our knowledge, this study is the first that examines the relationships among bank size, managerial ownership, institutional ownership, core deposits funding, and net interest margin using a structural equation modeling approach. However, the results of this study might be affected by the Covid-19 pandemic event which is declared on March 2020. Following the Covid-19 pandemic, the Indonesian central bank (i.e. Bank Indonesia) aggressively pursues a low-interest monetary policy to stimulate the faltering economy due to the pandemic.

The low-interest environment in the year 2020 might have significant impacts on depositors' bank preferences, banks' risk-taking behavior, deposits and loan rates setting by banks, as well as

banks' net interest margins. It is suggested that future research explore and compare the effects of bank size and ownership structure on banks' core deposits fundings and net interest margins for the periods covering before, during, and after the Covid-19 pandemic.

## References

- Ali, M., & Pua, C. H. (2018). Does Bank Size and Funding Risk Effect Banks' Stability? A Lesson from Pakistan. *Global Business Review*, 19(5). <https://doi.org/10.1177/0972150918788745>.
- Amidu, M., & Wolfe, S. (2013). The impact of market power and funding strategy on bank-interest margins. *The European Journal of Finance*, 9, 888–908. <https://doi.org/10.1080/1351847X.2011.636833>
- Amor, A. Ben. (2017). Ownership structure and bank risk-taking: Empirical evidence from Tunisian banks. *Afro-Asian Journal of Finance and Accounting*, 7(3), 227–241. <https://doi.org/10.1504/AAJFA.2017.085542>
- Angori, G., Aristei, D., & Gallo, M. (2019). Determinants of banks' net interest margin: Evidence from the Euro Area during the crisis and post-crisis period. In *Sustainability* (Vol. 11, Issue 14, pp. 1–20). <https://doi.org/10.3390/su11143785>
- Arnold, E. A., Größl, I., & Koziol, P. (2016). Market discipline across bank governance models: Empirical evidence from German depositors. *The Quarterly Review of Economics and Finance*, 61, 126–138. <https://doi.org/10.1016/J.QREF.2015.12.002>
- Banke, N. K., & Yitayaw, M. K. (2022). Deposit mobilization and its determinants: Evidence from commercial banks in Ethiopia. *Future Business Journal*, 8(32), 1–10. <https://doi.org/10.1186/s43093-022-00144-6>
- Barry, T. A., Lepetit, L., & Tarazi, A. (2011). Ownership structure and risk in publicly held and privately owned banks. *Journal of Banking and Finance*, 35(5). <https://doi.org/10.1016/j.jbankfin.2010.10.004>
- Ben Naceur, S., Marton, K., & Roulet, C. (2018). Basel III and bank-lending: Evidence from the United States and Europe. *Journal of Financial Stability*, 39. <https://doi.org/10.1016/j.jfs.2018.08.002>
- Bhagat, S., Bolton, B., & Lu, J. (2015). Size, leverage, and risk-taking of financial institutions. *Journal of Banking and Finance*, 59. <https://doi.org/10.1016/j.jbankfin.2015.06.018>
- Birchwood, A., Brei, M., & Noel, D. M. (2017). Interest margins and bank regulation in Central America and the Caribbean. *Journal of Banking & Finance*, 85, 56–68. <https://doi.org/10.1016/J.JBANKFIN.2017.08.003>
- Busch, R., & Memmel, C. (2016). Quantifying the components of the banks' net interest margin. *Financial Markets and Portfolio Management*, 30(4), 371–396. <https://doi.org/10.1007/s11408-016-0279-3>
- Çekrezi, A. (2022). Determinants of bank deposits in Albania. *International Journal of Economics and Finance Studies*, 14(2), 101–121. <https://doi.org/10.34109/ijefs.20220026>
- Chortareas, G. E., Garza-García, J. G., & Girardone, C. (2012). Competition, efficiency and interest rate margins in Latin American banking. *International Review of Financial Analysis*, 24, 93–103. <https://doi.org/10.1016/J.IRFA.2012.08.006>
- Choudhry, M. (2018). *An Introduction to Banking: Principles, Strategy and Risk Management*. In *An Introduction to Banking* (2nd ed.). John Wiley & Sons, Ltd.
- Claessens, S., Coleman, N., & Donnelly, M. (2018). “Low-For-Long” interest rates and banks' interest margins and profitability: Cross-country evidence. *Journal of Financial Intermediation*, 35, 1–16. <https://doi.org/10.1016/J.JFI.2017.05.004>
- Claeys, S., & Vennet, R. Vander. (2008). Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West. *Economic Systems*, 32(2), 197–216. <https://doi.org/10.1016/J.ECOSYS.2007.04.001>
- D'Agostino, R. B., & Belanger, A. (1990). A suggestion for using powerful and informative tests of normality. *The American Statistician*, 44(4), 316–321. <https://doi.org/10.2307/2684359>
- Doliente, J. S. (2005). Determinants of bank net interest margins in southeast asia. *Applied Financial Economics Letters*, 1(1), 53–57. <https://doi.org/10.1080/1744654042000303629>
- Driscoll, J. C., & Judson, R. A. (2013). Sticky Deposit Rates (No. 2013–80; Finance and Economics Discussion Series). <https://doi.org/10.2139/ssrn.2241531>

- Duquerroy, A., Matray, A., & Saidi, F. (2021). Sticky Deposit Rates and Allocative Effects of Monetary Policy. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3771345>
- Ehsan, S., & Javid, A. Y. (2018). Bank ownership structure, regulations and risk-taking: Evidence from commercial banks in Pakistan. *Portuguese Economic Journal*, 17(3). <https://doi.org/10.1007/s10258-018-0147-3>
- Entrop, O., Memmel, C., Ruprecht, B., & Wilkens, M. (2015). Determinants of bank interest margins: Impact of maturity transformation. *Journal of Banking & Finance*, 54, 1–19. <https://doi.org/10.1016/J.JBANKFIN.2014.12.001>
- Fungáčová, Z., & Poghosyan, T. (2011). Determinants of bank interest margins in Russia: Does bank ownership matter? *Economic Systems*, 35(4), 481–495. <https://doi.org/10.1016/j.ecosys.2010.11.007>
- Ganić, M. (2018). An empirical analysis of factors affecting bank interest margins: Evidence from the South East European Countries. *Comparative Economic Research*, 21(2), 81–98. <https://doi.org/10.2478/cer-2018-0013>
- Gavish, B., & Kalay, A. (1983). On the asset substitution problem. *Journal of Financial and Quantitative Analysis*, 18(1), 21–30. <https://doi.org/DOI:10.2307/2330802>
- Goodman, L. A. (1960). On the exact variance of products. *Journal of the American Statistical Association*, 55(292), 708–713. <https://doi.org/10.1080/01621459.1960.10483369>
- Greene, W. H. (2018). *Econometric analysis* (8th ed.). Pearson Education, Inc.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). McGraw Hill.
- Hammami, Y., & Boubaker, A. (2015). Ownership Structure and Bank Risk-Taking: Empirical Evidence from the Middle East and North Africa. *International Business Research*, 8(5), 271–284. <https://doi.org/10.5539/ibr.v8n5p271>
- Hawtrey, K., & Liang, H. (2008). Bank interest margins in OECD countries. *The North American Journal of Economics and Finance*, 19(3), 249–260. <https://doi.org/10.1016/J.NAJEF.2008.07.003>
- Hayes, A. F. (2022). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression Approach*. In The Guilford Press (3rd ed.). The Guilford Press.
- Ho, T. S. Y., & Saunders, A. (1981). The determinants of bank interest margins: Theory and empirical evidence. *Journal of Financial and Quantitative Analysis*, 16(4), 581–600.
- Islam, M. S., & Nishiyama, S. I. (2016). The determinants of bank net interest margins: A panel evidence from South Asian countries. *Research in International Business and Finance*, 37, 501–514. <https://doi.org/10.1016/J.RIBAF.2016.01.024>
- Jabra, W. Ben, Mighri, Z., & Mansouri, A. (2017). Determinants of European bank risk during financial crisis. *Cogent Economics & Finance*, 5, 1–20. <https://doi.org/10.1080/23322039.2017.1298420>
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305–360. [https://doi.org/10.1016/0304-405X\(76\)90026-X](https://doi.org/10.1016/0304-405X(76)90026-X)
- Khan, M., & Jalil, A. (2020). Determinants of interest margin in Pakistan: A panel data analysis. *Economies*, 8(2), 1–14.
- Lestari, H. S., Chintia, H., & Akbar, I. C. (2021). Determinants of net interest margin on conventional banking: Evidence in Indonesia Stock Exchange. *Jurnal Keuangan Dan Perbankan*, 25(1), 104–116. <https://doi.org/10.26905/jkdp.v25i1.5102>
- López-Espinosa, G., Moreno, A., & Pérez de Gracia, F. (2011). Banks' Net Interest Margin in the 2000s: A Macro-Accounting international perspective. *Journal of International Money and Finance*, 30(6), 1214–1233. <https://doi.org/10.1016/J.JIMONFIN.2011.06.001>
- Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5(2), 147–175. [https://doi.org/10.1016/0304-405X\(77\)90015-0](https://doi.org/10.1016/0304-405X(77)90015-0)
- Ng, M., & Lin, J. (2016). Testing for mediation effects under non-normality and heteroscedasticity: a comparison of classic and modern methods. *International Journal of Quantitative Research in Education*, 3(1/2). <https://doi.org/10.1504/ijqre.2016.073643>
- Nienaber, A. M., Hofeditz, M., & Searle, R. H. (2014). Do we bank on regulation or reputation? A meta-analysis and meta-regression of organizational trust in the financial services sector. *International Journal of Bank Marketing*, 32(5). <https://doi.org/10.1108/IJBM-12-2013-0146>

- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891. <https://doi.org/10.3758/BRM.40.3.879>
- Sääskilähti, J. (2018). Retail bank interest margins in low interest rate environments. *Journal of Financial Services Research*, 53, 37–68. <https://doi.org/10.1007/s10693-016-0262-1>
- Saunders, A., Cornett, M., & Erhemjants, O. (2021). *Financial institutions management: A risk management approach* (10th ed.). McGraw-Hill Education.
- Saunders, A., Schumacher, L., & Schiff, J. M. (2000). The determinants of bank interest rate margins: an international study. *Journal of International Money and Finance*, 19(6), 813–832. [https://doi.org/10.1016/S0261-5606\(00\)00033-4](https://doi.org/10.1016/S0261-5606(00)00033-4)
- Saunders, A., Strock, E., & Travlos, N. G. (1990). Ownership Structure, Deregulation, and Bank Risk Taking. *The Journal of Finance*, 45(2), 643–654. <https://doi.org/10.1111/j.1540-6261.1990.tb03709.x>
- Sidabalok, L. R., & Viverita, V. (2011). The determinants of net interest margin in the Indonesian banking sector. *SSRN Electronic Journal*, August, 1–23. <https://doi.org/10.2139/ssrn.1917367>
- Simoens, M., & Vennet, R. Vander. (2021). Bank performance in Europe and the US: A divergence in market-to-book ratios. *Finance Research Letters*, 40, 101672. <https://doi.org/10.1016/J.FRL.2020.101672>
- Sobel, M. E. (1982). Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models. *Sociological Methodology*, 13. <https://doi.org/10.2307/270723>
- Sobel, M. E. (1986). Some New Results on Indirect Effects and Their Standard Errors in Covariance Structure Models. *Sociological Methodology*, 16. <https://doi.org/10.2307/270922>
- Suriawinata, I. S. (2023). The implementation of SFAS 71, bank equity valuation, and the moderating effect of bank size. *The Indonesian Journal of Accounting Research*, 26(1), 1–2. <https://doi.org/10.33312/ijar.648>
- Thao, V. T. P., & Than, L. T. (2021). An empirical analysis of macroeconomic and bank-specific factors affecting bank deposits in Vietnam. *International Journal of Financial Resear*, 12(2), 172–183. <https://doi.org/10.5430/ijfr.v12n2p172>
- Trinugroho, I., Pamungkas, P., Ariefianto, M. D., & Tarazi, A. (2020). Deposit structure, market discipline, and ownership type: Evidence from Indonesia. *Economic Systems*, 44(2), 100758. <https://doi.org/10.1016/J.ECOSYS.2020.100758>
- Tsafack, G., Li, Y., & Beliaeva, N. (2021). Too-big-to-fail: The value of government guarantee. *Pacific-Basin Finance Journal*, 68, 101313. <https://doi.org/10.1016/J.PACFIN.2020.101313>
- Ünvan, Y. A., & Yakubu, I. N. (2020). Do bank-specific factors drive bank deposits in Ghana? *Journal of Computational and Applied Mathematics*, 376, 1–7. <https://doi.org/10.1016/J.CAM.2020.112827>
- Vuong, B. N., Tung, D. D., Giao, H. N. K., Dat, N. T., & Quan, T. N. (2020). Factors affecting savings deposit decision of individual customers: Empirical evidence from Vietnamese commercial banks. *Journal of Asian Finance, Economics and Business*, 7(7). <https://doi.org/10.13106/jafeb.2020.vol7.no7.293>
- Williams, B. (2007). Factors determining net interest margins in Australia: Domestic and foreign banks. *Financial Markets, Institutions & Instruments*, 16(3), 145–165. <https://doi.org/10.1111/j.1468-0416.2007.00122.x>
- Winarto, J., Susan, M., & Herlina. (2022). Determinants of customer deposits in the banking sector listed on Indonesia Stock Exchange. *Modus*, 34(2), 140–157. <https://doi.org/10.24002/modus.v34i2.5699>
- Yakubu, I. N., & Abokor, A. H. (2020). Factors determining bank deposit growth in Turkey: an empirical analysis. *Rajagiri Management Journal*, 14(2), 121–132. <https://doi.org/10.1108/RAMJ-05-2020-0017>
- Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2). <https://doi.org/10.1086/651257>
- Zhou, K., & Wong, M. C. S. (2008). The determinants of net interest margins of commercial banks in Mainland China. *Emerging Markets Finance and Trade*, 44(5), 41–53.