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The use of Dynamic Panel Data to Estimate the Profitability of Conventional Banks

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Abstract

This study aims to analyze internal and macroeconomic factors that affect the profitability of conventional banks in Indonesia, using Return on Assets (ROA) and Net Interest Margin (NIM) proxy. Previous research has often ignored the issue of endogeny and persistence of profitability. Using dynamic panel data from 37 conventional banks during the period 2012–2024, this study applied the Two-Step System Generalized Method of Moments (GMM) method. The results confirm the existence of significant persistence of profitability. It was found that independent factors had different (divergent) impacts on ROA and NIM. Specifically: The Loan-to-Deposit Ratio (LDR) has a positive impact on ROA but negative on NIM. Non-Performing Loans (NPLs) have a negative impact on ROA, but surprisingly positive on NIM. Macro factors (GDP, Inflation, Interest Rates) also show a complex duality of impacts. Banks are advised to maintain optimal LDRs while increasing low-cost Third-Party Funds (DPK) and diversifying non-interest income. Regulators are encouraged to analyze NIM as the core of intermediation efficiency, not just ROA.

Introduction

The financial system is a very important thing in the economy of a country, because of its ability to channel funds from and to investors so that an investment becomes more efficient (Mishkin, 2011), this is emphasized by the Law on Banking of 1998 article 1, which states that the main function of banks is to collect funds from the community and distribute them back to the community. According to (Al-Harbi, 2019), Kosumi and Zharku (2024) a good financial system will support economic growth in both developed and developing countries. One of the key elements of the financial system is the bank. Therefore, banks can contribute to ensuring the sustainability of economic growth and financial system stability (Ofori-Sasu et al., 2022), thus making banks known as development agents (Bayar, 2019). Likewise, with deregulation, technological advancements, and global economic integration, the banking sector is more global, and understanding various aspects of globalization, banking is one of the most important factors for the country's financial stability (Yin 2019).

Therefore, Klein and Weill (2022), argue that to understand the factors that affect the level of profitability of banks is essential, since profitability not only reflects the health of each bank but also indicates the stability and efficiency of the financial system as a whole. Furthermore, the level of continuity of profitability of banking institutions directly or indirectly has a positive impact on economic growth in the short and long term. Low profitability can lead to decreased market confidence, higher reputational risk, and increased costs in withdrawing deposits or funds (El-Chaarani et al., 2023).

Furthermore, Karim et al. (2023) explained that bank profitability is influenced by several factors, but it is difficult to clearly predict whether these factors are the same for each type of

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bank as well as each location, because the factors that affect the profitability of banks are so many, both macroeconomic and internal factors of banks that are intertwined and interact with each other so that they are so complex in influencing profitability of banks. Suppose the researcher states that the Capital Adequacy Ratio (CAR), which represents the bank's available capital, is a micro-factor that has a significant impact on profitability; The results of Mohsin et al., (2020) research concluded that CAR has a significant positive effect on profitability. Meanwhile, other micro factors that affect profitability are Non-Performing Loans (NPLs), which represent bank loans that experience late repayment; Kjosevski et al., (2019) confirmed the significant negative effects of NPLs on profitability. The size of the company or the size of the bank is also an important determinant of profitability. Silalahi et al., (2021) revealed that banks with sizable assets have higher efficiency than banks with small assets, thus making the former more profitable; Nugroho et al., (2020) affirm that bank size positively affects profitability (Muda et al., 2023; Manurung et al., 2022).

The operations of a bank cannot be separated from the macro factors that affect its operations (Yitayaw, 2021). Foreign exchange rates also influence people's decisions to place funds in banks, which ultimately affects credit disbursement thus, this factor is considered to be a determinant of profitability (Amidjaya and Widagdo, 2020; Barr and Kumhof, 2022). In addition, the interest rates offered by banks are also an attractive factor for people to put their money in banks Bank Indonesia's interest rate affects interest rates. Assfaw (2019) proves that Bank Indonesia's interest rate has a significant positive effect on profitability.

Meanwhile, to analyze the factors that affect bank profitability, not many researchers have used dynamic panel data. Whereas dynamic panel data analysis has emerged as a powerful tool in econometrics, especially for financial studies, as it allows researchers to control for unobserved heterogeneity and endogeny issues that often plague cross-sectional data. As highlighted by Saif-Alyousfi (2020), endogenicity issues can significantly distort static panel estimates, making dynamic models a more powerful option for analyzing bank performance over time. The use of dynamic models allows for a more accurate assessment of how various factors, such as operational efficiency, capital structure, and macroeconomic indicators, interact to affect profitability. For example, research has shown that cost efficiency and revenue management are important determinants of profitability, as evidenced by Rakshit's findings emphasizing the relationship between cost efficiency and bank performance (Rakshit, 2022 Rakshit and Bardhan, 2022)

Existing Research Gaps

The main difference between conventional banks and Islamic banks, is the interest treatment. Conventional banks charge and pay interest on loans and deposits, Islamic banks do not charge or pay interest, as it is prohibited by Islamic law. Instead they use a profit-sharing arrangement. In addition, conventional banks operate with an interest-based system, focusing on profitability, while Islamic banks adhere to Islamic principles, emphasizing fairness, transparency, and ethical considerations.

Based on data from the OJK in 2023, 87.62% are conventional banks and the rest are Islamic banks, but unfortunately there is still little special research on conventional banks. The research that specifically researched conventional banks that the author managed to obtain, namely: Harbi's (2019) examined the determinants of the profitability of conventional banks in the OIC Countries, Rolle, Herani and Javed (2020) in Pakistan, while research in Indonesia was conducted by Rani (2019), Chuandra and Setiawan (2020), Anggita and Prasadhita (2021), Wardhani (2020), Pangestuti and Muktiyanto (2021), Serly et al., (2022), Aryokho, et al.,

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(2023), Khalifaturofi'ah et al.,(2023), Astari and Rejekiningsih (2024). This is especially important for conventional bank managers, investors, and regulators.

Previous studies on bank profitability determinants have been: Investigating only one profitability ratio (e.g. ROA, ROE or NIM), Focusing on banking/financial specific factors or macroeconomic factors, but not both. Wahidudin, et al., (2017) using only NIM (Net Interest Margin), Abdul and Issa (2018), Serly et al., (2022), Majid and Ulina (2020), Kazim et al., (2022), Gazi et al., (2024), Lamonte et al., (2024) : ROA (Return on Assets) and ROE (Return On Equity)), Cuandra and Setiawan (2020), Herani and Javed (2020), Pangestuti and Muktiyanto (2021): ROA; Kasanah, et al.,(2022): ROA, ROE and NIM.

Meanwhile, to overcome the endogenicity problem that may arise in the panel data, many researchers use dynamic panel data analysis, but unfortunately there are still many who ignore estimator bias from the use of GMM (Widodo and Juardi, 2020).

Reasons for This Research

This study is a comprehensive study that examines the impact of certain macroeconomic and financial-banking factors on the key profitability ratios (ROA and NIM) of conventional banks in Indonesia. This research is expected to provide a more comprehensive understanding of the determinants of bank profitability in Indonesia, as it is very important considering the role of the banking sector in Indonesia, especially conventional banks, in financing the economy and supporting growth. In order to provide stronger results econometrically, estimator bias testing was also carried out due to the use of GMM (Widodo and Juardi, 2020).

Research objectives

This study aims to provide a comprehensive overview of the profitability of conventional banks in Indonesia which is important for investors, banks, and regulators. This study also aims to identify macroeconomic and internal factors of conventional banks that significantly affect the profitability (ROA and NIM) of conventional banks in Indonesia using GMM procedures. The findings of this study are expected to help conventional banks in Indonesia to increase their profitability and competitiveness, as well as guide regulators in formulating appropriate policies for the banking sector.

Literature Review

Research on conventional banks

It is generally known that conventional banks are financial institutions that carry out their operations based on conventional economic principles. This bank provides a wide range of services such as deposits, loans, and investments, the main difference with Islamic banks is that the main income is from interest, both loan interest, deposit interest and so on. Until now, the number of conventional banks in Indonesia is still dominant, BPS (Central Statistics Agency) data in 2023, shows that conventional banks are still dominant in Indonesia because of the 105 existing commercial banks, 87.62% are conventional banks, while the remaining 12.38% are Islamic banks. Unfortunately, there is still little research that specifically examines the profitability of conventional banks. Based on the literature obtained by the researcher, the research on determining the profitability of conventional banks Based on the grouping of variables, is divided into cranes, namely: the researcher only uses internal bank variables and internal bank variables and macroeconomics. Meanwhile, based on the countries studied, conventional bank research in certain countries and only covers certain countries. Therefore, this study uses a sample of conventional banks with internal bank variables and macroeconomic variables, with the hope that a more comprehensive analysis and sharper analysis will be obtained, because it uses GMM analysis. The advantages of GMM analysis in addition to a

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more robust option for analyzing the performance of banks over time. The use of dynamic models allows for a more accurate assessment of how various factors, the value of the profitability lag variable value indicates the level of competency among the conventional banks studied, the lower, closer to zero, the greater the level of competency (Sarkar and Rakshit, 2024).

Al-Harbi (2019) examined the determinants of profitability of 686 conventional banks operating in 52 Organizations of Islamic Cooperation (OIC) in 1989 - 2008. The dependent variables used are ROA (Return On Asset) and Net Interest Margin (NIM), while the independent variables are internal banks: Capital adequacy ratio (CAR), Loans, Deposits, size, off-balance sheet activities (OOI), Foreign ownership (FRGN) while macroeconomics: GDP growth, Real interest rates, taxation, Deposit insurance, oil shocks, Stock market capitalization, Banking sector development. Meanwhile, the analysis used is multiple linear regression analysis. The key findings are: Equities, foreign ownership, off-balance sheet activities, real GDP growth, real interest rates, and concentrations drive bank profitability. Deposits lower profitability, contrary to findings from developed countries. GDP per capita, market capitalization, and bank size have no impact on profitability. The development of the banking sector will increase profitability in the long run. Off-balance sheet activity and net interest margin were positively correlated, contrary to findings from developed countries.

Cuandra, and Setiawan, (2020), the main focus of this research paper is to analyze the factors that affect the profitability of conventional banks in Batam City, Indonesia during the period 2014-2019, and using OLS regression. The key factors examined were capital adequacy ratio (CAR), non-performing loans (NPL), loan-to-deposit ratio (LDR), operational efficiency ratio (BOPO), and net interest margin (NIM). The paper found that CAR and BOPO have a significant negative effect on return on assets (ROA), suggesting that higher capital levels and operating efficiency lead to higher profitability. NPLs were also found to have a significant negative impact on ROA, suggesting that higher non-performing loans are detrimental to bank profitability. On the other hand, LDR and NIM were found to have no significant effect on ROA. Meanwhile, the analysis used is multiple linear regression analysis.

Anggita and Prasadhita (2020) examined the impact of Loan to Deposit Ratio (LDR), Inflation, Intellectual Capital (IC), and Net Profit Margin (NPM) on the profitability of conventional banks listed on the Indonesia Stock Exchange from 2014-2018, and used OLS regression. The main findings and results of this study are: The Loan-to-Deposit Ratio (LDR) has a positive effect on profitability. This means that an increase in the LDR ratio will increase the bank's profitability. Inflation has a positive effect on profitability. This shows that inflation can have an impact on banking profitability, and banks need to implement policies to maintain liquidity levels despite the effects of inflation. Intellectual Capital (IC) does not have a positive effect on profitability. A high or low IC level does not affect the bank's profitability. Net Profit Margin (NPM) has a positive effect on profitability. This means that an increase in the NPM ratio will increase the bank's profitability. These findings meet the main purpose of the study, which is to analyze the influence of LDR, Inflation, IC and NPM on the profitability of conventional banks listed on the Indonesia Stock Exchange from 2014-2018.

Wardhani (2020) This research was conducted in conventional banks listed on the Indonesia Stock Exchange during the period 2014-2018. The data used is secondary data in the form of panel data obtained from the official websites of the Indonesia Stock Exchange (www.idx.co.id), IDN Financial (www.idnfinancials.com), and Bank Indonesia (www.bi.go.id). Data collection for this study was carried out in November 2019. The population of this study is all finance companies in Indonesia listed on the Indonesia Stock Exchange for the period 2014-2018, namely 92 companies listed on the www.idx.co.id website.

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The sampling technique uses purposive sampling. This study aims to analyze the impact of Loan to Deposit Ratio (LDR), interest rates, inflation, and intellectual capital (IC) on the profitability of Indonesian Conventional Banks. This study uses panel data regression with three models: Common Effect, Fixed Effect, and Random Effects. The results of Chow and Hausman's tests show that the best models are random-effect models. The results of the random-effects model show that: LDR and inflation have a positive effect on profitability, but interest rates and intellectual capital (IC) do not affect profitability.

Rolle, et al., (2020) This study aims to determine the impact of internal factors (bank specific) and external factors (macroeconomics) on the profitability of conventional banks in Pakistan. The internal factors analyzed are Liquidity, Size, and Capital Adequacy, while external factors are Gross Domestic Product (GDP) and Inflation. The study used panel data from 17 conventional banks in Pakistan during the period 2014-2018 and used OLS regression and Q Tobin ratios to analyze the determinants of profitability. The analysis shows that GDP has a significant negative impact on profitability, while inflation has no impact.

Pangestuti and Muktiyanto (2021) this study aims to analyze and determine the influence of capital adequacy, credit risk, and liquidity on the profitability of Conventional Commercial Banks listed on the Indonesia Stock Exchange (IDX), for the period 2015 – 2019 and using OLS regression. The results show that capital adequacy and credit risk have a negative impact on profitability, while liquidity does not affect profitability.

Serly et al., (2022) This study aims to determine the factors that affect the profitability of conventional commercial banks listed on the Indonesia Stock Exchange from 2016-2020. Profitability is measured using two proxies: Return on Assets (ROA) and Return on Equity (ROE). The results show that: Loan-to-asset ratio, BOPO, labor costs to revenue, and NPLs have a significant impact on ROA. Bank size, BOPO, and labor costs to revenue have a significant impact on ROE. Other factors such as securities specialization, deposit specialization, and CAR do not have a significant impact on profitability measures.

Aryokho et al., (2023) This paper examines the influence of four key factors (Capital Adequacy Ratio (Capital Adequacy Ratio (CAR), Non-Performing Loan (NPL), Operating Expenses to Operating Income (BOPO), Loan to Deposit Ratio (LDR)) on the profitability (ROA) of conventional commercial banks in Indonesia from 2018-2020. The results of the study show that CAR has a positive and significant effect on ROA, This paper finds that NPLs have a negative and significant effect on ROA, This study shows that BOPO has a negative and significant effect on ROA and The results show that LDR has a positive but not significant effect on ROA.

Khalifaturofi'ah, et al., (2023) examined the impact of COVID-19, bank-specific factors, and macroeconomic indicators on the profitability of 18 conventional banks in Indonesia from 2009 to 2021. The study used a static panel data regression method and found the fixed effect model to be the most suitable for analysis. The paper states that 'capital adequacy ratio (CAR) has a positive impact on the profitability of conventional banks in Indonesia. The paper shows that 'bank size shows a positive impact on profitability. Larger banks, usually indicated by larger total assets, tend to utilize their assets more efficiently. Higher economic growth is associated with increased banking profitability, as shown by the positive signs of GDP in the analysis. Meanwhile, interest rates proxied with Bank Indonesia's benchmark interest rate (SBI) were positively correlated with greater banking profitability.

Astari and Rejekiningsih (2024) This study aims to examine the factors that affect the profitability level of conventional banking in Indonesia from 2010 to 2019. The level of profitability is represented by the Return on Assets (ROA) ratio. This study uses 6 groups of

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conventional banks in Indonesia as the object: state-owned banks, foreign exchange private banks, non-foreign exchange private banks, regional development banks (BPDs), joint ventures, and foreign banks. The independent variables analyzed were: interest rate spread, Bank Indonesia Certificate (SBI), third-party funds (DPK), and interbank liabilities. The results show that interest rates spreads, SBIs, and deposits have a positive and significant effect on ROA, while interbank liabilities have a negative and significant effect on ROA. Simultaneously, all independent variables affect ROA.

Usman and Lestari (2019) conducted a study on the determinants of the profitability of conventional banks in Indonesia for the period 2008-2017. Using 25 conventional banks and bank profitability proxied by ROA and independent variables: capital adequacy, asset quality, management efficiency, liquidity, and GDP growth rate and panel data analysis. The main findings are: Asset quality has a negative impact on bank performance, Management efficiency has a positive impact on bank performance, Capital adequacy, liquidity, and GDP growth rate do not affect bank performance.

Bank Profitability

Profitability is a ratio used to look at a company's ability to make a profit. Profitability is one of the factors to assess the performance of a company (Aryati and Purwanto, 2019). Profitability is defined as a condition that generates financial gains or profits through the exchange of potential risks (Ali and Maamor, 2018). In assessing the performance of a bank manager, profitability is often used as a measuring tool to determine the extent of management's success in achieving its performance. Therefore, profitability can be the spearhead of banking performance where profitability arises from management's ability to understand market forces and create efficiencies. Under normal circumstances, profitability will be achieved when the industry is very competitive and able to operate efficiently (Mala and Baharudin, 2018). One theory that tries to explain a bank's profitability is the conductor-performance structure (SCP). SCP theory analyzes how the structure of the banking market will affect the behavior of banks and ultimately affect their profitability. For example, the concentrated banking market (dominated by a few large banks) allows these banks to set higher interest rates and thus earn greater profits (Mala and Baharudin, 2018).

The ratio that is often used to measure the level of profitability of a bank is the Return on Assets (ROA). A ROA indicates a company's ability to use all of its assets to generate pre-tax profits. This ratio is important for management to evaluate the effectiveness and efficiency of the company's management in managing all the company's assets. The greater the ROA, the more efficient the company's use of assets, or in other words, the same amount of assets can lead to greater profits or vice versa. ROA is a profitability parameter to measure how much a bank earns from the total assets a bank has (Astari and Rejekiningsih, 2024), (Abduh and Issa, 2018).

Another ratio to measure the bank's profitability level is the NIM (Net Interest Margin) Ratio. The NIM ratio is used to measure a bank's ability to generate income from interest, by looking at the bank's activities in lending. Bank revenues come from the difference between the interest on loans disbursed and deposits received (Thamrin et al., 2019). Large net interest margins make it difficult for banks to expand their functions as financial intermediaries, as low deposit interest rates reduce the motivation to save and conversely high lending rates create a heavy burden for companies to invest (Claessens et al., 2017), NIM or spreads that are too large can weigh on public savings and investment potential in the economy. So that banks are required to be able to support their operations at the lowest possible cost to increase economic growth. (Macenning, et al., 2023). Information related to the bank's NIM ratio is also a signal in making investment decisions (Endri and Fathony, 2020).

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Factor internal bank

CAR (Capital Adequacy Ratio) is one of the ratios that is widely known to affect the profitability of banks**.** If the CAR value is considered high, the bank is more protected from bankruptcy, has access to cheap funds, is more flexible in pursuing business opportunities, and has the ability to absorb unexpected losses. Thus, higher profitability can be expected for these banks, and this is confirmed by numerous studies. However, a negative relationship between profitability and a high capital ratio can be expected given that well-capitalized banks are considered safer because they take less risk, and therefore, according to financial theory, produce lower returns. A study conducted by Harbi (2019) found a negative relationship between profitability and capital adequacy. The higher the CAR, the stronger the bank's ability to bear the risk. If the CAR value is high in accordance with Bank Indonesia regulations (at 8%), it means that the bank can finance the bank's operations, and can make a significant contribution to the bank's profitability (Thamrin et al., 2019).

The relationship between bank capital and profitability has also been studied extensively, but the results have been mixed. Research conducted by Abbas et al., (2019) found a positive relationship between bank capital and profitability during the post-crisis era in Asia and the United States. Ozili (2017) also found a positive effect of bank capital on the profitability of commercial banks in Africa. Tran et al., (2016) found an inverse relationship between bank capital and profitability for larger banks, and a positive relationship for smaller institutions. The lack of consensus on the relationship between bank capital and profitability suggests the need for further research. Meanwhile, the results of research by Mashamba and Chikutuma, (2023) concluded that CAR in banks in Zimbabwe has a positive and significant impact on bank profitability.

The results of research conducted by experts, generally show that the Capital Adequacy Ratio has a significant positive effect and has an impact on Return on Asset. This may be because the higher the capital of conventional banks, the higher the Return on Assets in conventional banks, because this greatly supports the continuity of business activities, the more sufficient the capital, the tendency is that the profit generated as a return on assets will also increase. Research by Nurlaela et al., (2019), Javaid and Alalawi (2018), Fendy and Setiawan (2020), Aryokho, et al., (2023) showed the same results, namely a positive and significant relationship with bank profitability. Furthermore, Al-Harbi (2019) added that banks with high capital ratios are more flexible in running their business and taking advantage of new opportunities, so it can be expected that banks with more capitalization will achieve higher profitability. Based on the above, the hypothesis in this study is:

There is a positive and significant relationship between CAR and the bank's profitability level.

The NPL (Non-Performing Loan) ratio is a financial ratio that measures the quality of a bank's assets by comparing the amount of loans that the debtor cannot repay with the total loans provided, meaning that the higher the NPL, the lower the level of profitability that can be achieved. The NPL ratio is used to measure how well a bank's management is able to overcome and manage non-performing loans. The higher the NPL, in other words, the greater the number of non-performing loans, the worse the bank's credit quality because it will cause losses, on the other hand, if the NPL is lower, the bank's profit or profitability (ROA) will increase ((Thamrin et al., 2019). Mosey et al., (2018) define credit risk, also known as default risk, as a risk caused by the customer's failure or inability to repay the loan amount obtained from the company and its interest within a predetermined period of time. Credit risk is a risk that arises because a loan may default. One form of credit risk is non-performing loans, which are categorized as non-

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current, doubtful, and bad loans. Credit risk control is carried out through a series of banking risk management processes. The effectiveness of the banking risk management process in controlling credit risk is the effort made to utilize the resources owned, both in the form of human resources and technological resources, in the right way and achieve the goal, namely minimizing credit risk.Through Bank Indonesia Regulation No. 17/11/PBI/2015, Bank Indonesia sets the criteria for an NPL ratio below 5% in order to maintain a good bank value. Research conducted by SobolI, et al., (2023), Aryokho, et al., (2023), Pangestuti and Muktiyanto, (2021) concluded that NPLs have a significant negative effect on bank profitability. Based on this, the hypothesis of this study is:

NPLs have a negative and significant effect on the bank's profitabilit

Another ratio that is often used is bank size (LTA). However, empirical studies on the influence of bank size on profitability show inconclusive results. On the one hand, the higher the value of a bank's assets, the lower its operating costs due to economies of scale; Therefore, higher profitability can be expected as the bank's assets increase. On the other hand, very large banks can achieve lower profitability, for example, due to bureaucratic procedures. Bank size is usually used to assess the scale of the economy in the banking sector. Banks that have a large size can reduce costs due to their economies of scale and wide coverage. Conversely, if the assets owned are not managed efficiently, the large size of the bank can reduce the bank's profitability. Bank size is used as a proxy to see the cost gains associated with the bank's size or assets. The size of the bank is expected to have a positive relationship with profitability. However, the opposite result, namely a negative and significant relationship between the size of the bank and its profitability, was found by Al-Homaidi et al., (2018). On the other hand, Anarfi et al., (2016) found that the size of the bank did not have a significant impact on its profitability. Research conducted by (Ali and Puah, 2019; Batten and Vo, 2019; Dao and Nguyen, 2020) show that there is a positive relationship between bank size and bank profitability. Showing that there is a positive relationship between bank size and bank profitability level, therefore, the hypothesis of this study is:

There is a positive and significant relationship between bank size and bank profitability.

The efficiency ratio is used to analyze how well a bank manages and controls its assets. Standard measures of efficiency include cost-to-revenue and cost-to-asset ratios, which sporadically distinguish between personnel and non-personnel costs (SobolI et al., 2023). Most research on banks shows that the lower the ratio (better efficiency), the greater the bank's profitability. Operating Expense to Operating Income Ratio (OEOIR) is a proxy for measuring the effectiveness and efficiency ratio of banking operations. The purpose of this ratio is to measure the bank's ability to cover operating expenses using the bank's operating income. The smaller the OEOIR ratio means the better the bank's performance, as the resources the bank has are used efficiently. Conversely, if the OEOIR ratio is getting larger, it means that the bank's performance is inefficient. The more efficient a bank is, the better its profitability rate. Thamrin et al. (2019) and Fungáčová et al. (2020) attribute efficiency issues to structural and political incentives that prevent cost minimization, thus adversely impacting bank profitability. Mashamba and Chikutuma, (2023) and based on research in Zimbabwe show that efficiency has a positive and significant impact on the profitability of banks. In contrast, research by SobolI at al., (2023) in the Middle East region concluded that efficiency has a significant negative effect on bank profitability. Based on the above, the hypothesis of this study is:

There is a negative and significant relationship between OEOIR and bank profitability

Loan to Deposit Ratio (LDR) is a ratio to measure the composition of the amount of credit provided compared to the amount of public funds and own capital used. Bank Indonesia

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Regulation No. 17/11/PBI/2015 states that the bank's LDR ratio is estimated to be between 78% and 92%. The higher the LDR, the higher the bank's profits, this is due to the amount of credit disbursed and the assumption that the bank can distribute its credit effectively. ((Thamrin et al., 2019). Credit risk is the risk of loss arising from the failure of borrowers to repay loans or meet their contractual obligations. Credit risk is one of the main sources of income and risk for banks, as loans are their core business activity. However, if banks fail to manage credit risk properly, bad debt can erode banks' profits and capital (Dang and Nguyen, 2022). Credit risk is proxied by the ratio of allowance to loan losses, which measures the ratio of allowance to loan losses to total loans. Recent studies have also examined the impact of credit risk on bank profitability in various regions and contexts, such as Africa (Opoku-Mensah et al., 2019), Asia (Farooq et al., 2021), and Islamic banking (Al-Harbi et al., 2019). Aryokho et al., (2023) have a positive but not significant effect on ROA. Based on this, the hypothesis of this study is:

The Loan to Deposit Ratio (LDR) has a positive and significant influence on the bank's profitability.

Macroeconomic Factors

One of the macroeconomic factors that is often used to predict bank profitability is GDP growth. GDP growth is the most common and direct measure of macroeconomic development, often used as a variable that reflects the business cycle. High GDP growth will stimulate the demand for banking financing; in addition, as economic conditions improve, the amount of unrepaid loans will decrease (SobolI, et al., 2023). Therefore, it is expected that there is a positive relationship between GDP growth and bank profitability. On the other hand, the opposite result, a negative relationship between GDP growth and bank profitability was found by Al-Homaidi et al., (2020), who investigated the performance of conventional banks as well as Mateev and Bachvarov (2020), and the lack of a significant correlation between GDP growth and the profitability of Islamic banks was found in a study conducted by. Mashamba and Chikutuma, (2023) Zimbabwe's Gross Domestic Product (GDP) has no significant effect on bank profitability. (SobolI, et al., 2023) GDP has a significant positive effect on bank profitability. Based on this, the hypothesis in this study is:

GDP growth has a positive and significant effect on banking profitability

The relationship between inflation and bank profitability has been widely discussed in the literature. Inflation developments can reflect business cycles (Bikker and Vervliet, 2018). It is assumed that inflation has a positive impact on probability because bank revenues increase more with inflation than with costs. In an inflationary environment, banks also receive higher revenues from late loans to customers (Sobol, et al, 2023). It should be noted that this is the case when inflation can be anticipated; However, if the bank fails to capture expected inflation and adjust profitability, then it is possible that the bank's costs may increase faster than revenue and, as a result, negatively impact the bank's performance. Inflation is a general increase in the price of goods and services over time. The relationship between inflation and bank profits is ambiguous, as it depends on the ability of banks to forecast inflation developments and adjust their interest rates accordingly (Yüksel et al., 2018). If banks can accurately predict inflation trends, they can increase their revenues faster than their costs and reap higher profits. However, if a bank fails to anticipate changes in inflation or faces regulatory constraints in setting interest rates, banks may experience a decline in margins and a decrease in profitability. Therefore, this study expects a positive or negative relationship between inflation and bank profitability. The annual inflation rate was used in this study. Several recent studies have also investigated the influence of inflation on bank profitability in various countries, such as Turkey (Yüksel et al.,

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2018), Pakistan (Farooq et al., 2021), Mashamba and Chikutuma, (2023), and Zimbabwe (Mashamba and Chikutuma, 2023). Based on the above, the hypothesis of this study is:

There is a positive and significant relationship between inflation and bank profitabilit

Monetary policy, by applying interest rates too quickly, will tend to shut down economic activity. The increase in Bank Indonesia's benchmark interest rate has had an impact on tightening banking liquidity. Banks have difficulty getting cheap funds from third parties (current accounts, savings, and deposits). This results in higher bank fund costs. As a result, when there is an increase in high loan interest rates, the value of the customer's business is no longer proportional to the financing provided. If customers start objecting to high interest rates, it will increase the likelihood of bad debt, which will have an impact on the bank's profitability. Meanwhile, rising interest rates have made companies and the public reluctant to borrow, resulting in a decline in bank profits in the long run. Research conducted by Wardhani (2020) shows that interest rates have no effect on bank profitability.

Rising interest rates discourage people and companies from taking out new loans, leading to a decline in bank profits in the long run. However, this effect can be positive in developing countries (Al-Harbi 2019). In some studies, a country's stock market has been linked to the bank's profitability. A positive effect is expected for these variables as the stock markets of developed countries increase the information available to banks, allowing them to better assess risk. Likewise, banks benefit from commissions earned from managing their clients' portfolios. Nevertheless, prominent securities markets can negatively impact a bank's profitability as it can replace them as a source of financing. It has also been found that the larger the banking sector of a country, the more competition there is among its entities, which leads to lower profitability. However, a large banking sector can also provide more business opportunities and reduced costs, thereby increasing profitability and margins. Similarly, market concentration can affect returns. In this regard, some studies detect positive associations, while others suggest that greater concentrations do not necessarily imply greater profitability (Lamothe et al., 2024). Based on this, the hypothesis of this study is:

There is a negative and significant relationship between interest rates and bank profitability

Table 1. Research Variables and Measurement

Variable	Acronym	Measure	Evidence from Prior Studies
Dependent variable : Banks' profitability			
Profitability	ROA	$ROA = \frac{Net\ Prof}{Total\ Asset}$	Al-Homaidi et al., (2018), Gazi et. al., (2024), Lamothe et. al., (2024), Mirovi´c et. al., (2024), Priharta and Gani. (2024), Rohman and Nurkhin (2022), Abduh and Issa (2018), Nguyen (2022), Macenning, et al., (2023)
	NIM	$NIM = \frac{Net\ Interest\ incor}{Total\ Asset}$	Al-Homaidi et al., (2018), Sarkar and Rakshit (2024), Rohman and Nurkhin (2022), Macenning et al., (2023)
Independent variables			
Assets Size	LTA	Ln(Total Asset)	Al-Homaidi et al., (2018), Gazi et. al., (2024), Lamothe et. al., (2024), Rohman and Nurkhin

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			(2022), Abduh and Issa (2018), Macenning et al., (2023)
Capital Adequacy Ratio	CAR	$\frac{Tier\ 1\ Capital + Tier\ 2\ Capital}{Risk - Weighted\ As}$	Gazi et. al., (2024), Priharta and Gani. (2024), Rohman and Nurkhin (2022), Macenning et al., (2023)
Operating Expense to Operating Income Ratio	OEOIR	$\frac{Total\ Operating\ Exp}{Total\ OperatingIn}$	Gazi et. al., (2024), Sarkar and Rakshit (2024), Lamothe et. al., (2024), Mirovi´c et. al., (2024), Abduh and Issa (2018)
Non-Performing Loan (NPL) Ratio	NPL	$\frac{Total\ Non - Perfor\ Loan}{Total\ Gross\ Loa}$	Mirovi´c et. al., (2024), Priharta and Gani. (2024), Rohman and Nurkhin (2022), Macenning et al., (2023)
Loan-to-Deposit Ratio	LDR	$\frac{Total\ Loans\ Given}{Total\ Deposits\ Received}$	Sarkar and Rakshit (2024), Macenning, et al., (2023)
Growth Gross Domestic Product	gdbp	$gdbp = \frac{gdp_t - gdp_{t-1}}{gdp_{t-1}}$	Al-Homaidi et al., (2018), Gazi et. al., (2024), Sarkar and Rakshit (2024), Lamothe et. al., (2024), Mirovi´c et. al., (2024), Abduh and Issa (2018)
Inflation	inf	Annual inflation rate	Gazi et. al., (2024), Sarkar and Rakshit (2024), Mirovi´c et. al., (2024), Abduh and Issa (2018)
BI-rate	brate	Annual bank Indonesia rate	Lamothe et. al., (2024)

Methods

The purpose of this study is to examine the influence of internal bank factors and macroeconomic factors on the performance of conventional banks in Indonesia. The research data starts from 2012 to 2024, with a sample of 37 banks. Data on all variables is taken from each bank's annual financial statements. The variables and abbreviations used for this analysis are presented in table 1. To explore the basic relationships of the data, descriptive statistics are calculated as illustrated in Table 2. Table 3 is used to test the problem of Multicollinearity. shows the correlation between independent variables, VIF and Tolerance. According to Brooks (2019), if the correlation value between the independent variables is between -0.8 to 0.8, then it is suspected that there is no multicollinearity problem.

Dynamic Panel Data

As mentioned earlier, dynamic panel data is used for data analysis, while the method uses GMM (General Method of Moment). The use of GMM, according to Widodo (2020) and Widodo and Juardi (2020) is because it is able to overcome the problem of endogeny and consistent parameter estimation. In general, the dynamic panel data model is (Widodo and Juardi, 2020):

$$y_{it} = \gamma_o y_{it-1} + \gamma_1 x'_{it} + u_{it} \quad \text{..... (1)}$$

with $\mu_{it} = u_i + v_{it}$ where $u_i \sim IID(0, \sigma_u^2)$ and $v_{it} \sim IID(0, \sigma_v^2$ are independent of each other.

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Where x'_{it} is an independent variable consisting of company and macroeconomic characteristics. Provided that $|\gamma_o| < 1$ The use of CEM, FEM, or REM panel data will produce biased and inconsistent estimates (Verbeek, 2017). Furthermore, Verbeek (2017) shows that the use of first-difference can contain bias in limited (small-sized) samples, this is because the lagged level of the series is weakly correlated with the next first-difference, so the instrument variables available for the first-difference equation are weak and inefficient, therefore it is recommended to use the system GMM method. In contrast to the first-difference GMM model, the system GMM model uses the lagged level of $y_{i,t}$ as the instrument variable in both the first difference and level, so it not only uses the condition moments and instrument variable matrix from the first difference model but also the instrument variable and level.

For the GMM approach to be valid, according to Widodo and Juardi (2020), the model must meet the following assumptions:

Simultaneous significance testing

Simultaneous significance testing uses the Wald test. This test is used to determine whether a relationship exists within the model. The Wald test hypothesis, according to Arellano and Bond (1991) as cited in Widodo and Juardi (2020), is: H_0: There is no relationship within the model. The test statistic is: $w = \hat{\beta}'\hat{V}^{-1}\hat{\beta}' \sim \chi^2_{df=k)}$,where $\hat{V} = \sum_{i=1}^{n} Z_i'\Delta v_i \Delta v_i' Z_i$ with Δv_i is the error term transformation vector and Zi is the instrument matrix, with the condition that the Zi matrix contains valid instruments for each specified period. The decision to reject Ho if the test value w is greater than $\chi^2_{df=k)}$. In this study, it is expected to reject Ho

Research Instrument Validity Test

Instrument validity testing examines whether the number of instrument variables used exceeds the number of estimated parameters (overidentifying restriction). The Sargan test is used for this purpose. The hypothesis is H_0: Overidentifying restriction. The model estimation is valid using the following test statistics:

$$s = \hat{V}'Z\left[\sum_{i=1}^{n} Z_i'\Delta v_i \Delta v_i' Z_i\right]^{-1} Z'\hat{V} \sim \chi^2_{df=p-k-1)}$$

with $\hat{V}$ is an error term for the model estimator. The decision to reject Ho, if the value of the test statistic s is greater when compared to $\chi^2_{df=p-k-1)}$. Where p is the number of columns for Z. In this study, it is expected that there will be acceptance of Ho.

Autocorrelation Test

The component vi,t is an error that is assumed not to experience autocorrelation, but in the estimation in the *process the first difference* is obtained ($v_{i,t} - v_{i,t-1}$) so that E($v_{i,t} - v_{i,t-1}$) does not need to be zero. However, for the next order to see the consistency of the GMM conjecture, it is still subject to the assumption that E($v_{i,t} - v_{i,t-1}$) = 0, or the absence of autocorrelation between $v_{i,t}$ and $v_{i,t-1}$. The Arellano-Bond statistic is used to test the consistency of the conjectures obtained from the GMM process. The hypothesis is:

H_0: There is no autocorrelation on *the first* order first difference term error

H_1: There is an autocorrelation on *the first order term difference error* of the first order

The test statistics are:

$$m_i = \frac{\hat{v}'_{-i}\hat{v}_*}{\hat{v}^{1/2}}$$

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With i = 1,2; mi is the Arellano-Bond statistic i, it is the error lag vector , $\hat{v}'_{-i}$ of the regression equation estimation, while it is q x 1 vector that is cropped to adjust where q = N(T-2-i) and is the error estimator vector of Arrellano – Bond (1991). The Arellano-Bond test statistics follow a normal distribution, the decision minus $H\hat{v}'_{-i}\hat{v}_{*}\hat{v}'_{-i}\hat{v}_{o}$ if the mi is greater than Zα. The model is said to be consistent when there is an autocorrelation on *the 1st-order first-difference* error (in other words, Subtract Ho for m_1) and there is no autocorrelation on the first-difference error on the 2nd-order *first-difference* error (accept Ho for m2).

Unbiased

The GMM estimator is said to be unbiased, if the value of the coefficient of the dependent variable lag (in this case Leverage lag) obtained from the GMM process is located between the leverage lag of the Fixed Effect static panel data model and the leverage lag of the Common Effect panel data model Zu (2007) in Purwanto and Juardi (2020).

Results and Discussion

Tabel 2. Descriptive statistics

Variable	Mean	std. dev.	Min	Max
roa	0.9969	2.4767	-15.8900	5.4200
nim	6.0893	11.3447	-3.5200	148.2800
Bank-Specific Determinants (Independent Variables)				
(oeoir)	89.2105	30.2320	0.2400	287.8600
ldr	88.7409	39.2337	12.3500	630.8200
lta	17.6886	2.3109	10.3439	23.9177
npl	2.9800	2.1888	0.0000	22.2700
car	25.4505	17.0863	8.0200	148.2800
Macro-Economic Determinants (Independent Variables)				
infl	4.1233	2.1976	1.6800	8.3800
gpdrb	4.3967	1.9974	-2.0700	5.5600
birate	6.1042	1.4101	3.5000	7.7500

Table 1 shows the descriptive statistics of the research variables. From the table, it can be seen that the dependent variables of ROA and NIM have an average ROA of 0.9969 percent lower when compared to NIM of 6.0893 percent. Meanwhile, the average OEOI is 89.2105, LDR 88.7409, LTA 17.6886, NPL 2.9800 and CAR 25.4505. Meanwhile, macroeconomic variables, inflation is 4.1233, GDP growth is 4.3967 and the rate is 6.1042. Table 2 shows the correlation of the variables used in this study. The ROA variable has a positive correlation with the Size variable (lta), the Inflation variable (inf), the GDP growth variable (gpdrb) and the interest rate variable (bi_rate), negative with oeoir, ldr, npl and car. The NIM variable is negatively correlated with LDR, size (LTA) and NPL, positive correlation with the oeoir variable, the Inflation variable (inf), the GDP growth variable (gpdrb) and the variable interest rate.

Table 3. Multicollinearity Testing

	roa	nim	oeoir	ldr	lta	npl	car	inflasi	gpdrb	birate
Profitability Measurements (Dependent Variables)										
roa	1.0000									
nim	-0.4196	1.0000								
Bank-Specific Determinants (Independent Variables)										
oeoir	-0.9043	0.3754	1.0000							
ldr	-0.0245	-0.0111	0.0209	1.0000						

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lta	0.3728	-0.1341	-0.3709	-0.0794	1.0000					
npl	-0.4283	-0.0950	0.4110	-0.0039	-0.1611	1.0000				
car	-0.1801	0.5387	0.1645	0.1898	-0.2076	-0.1767	1.0000			
Macro-Economic Determinants (Independent Variables)										
inflasi	0.1448	-0.0074	-0.1309	0.0693	-0.1009	-0.1417	-0.0378	1.0000		
gpdrb	0.1056	0.0061	-0.1193	0.0541	-0.0492	-0.1342	-0.0089	0.4357	1.0000	
birate	0.0236	0.0163	-0.0518	0.0516	-0.1234	-0.0213	-0.1891	0.1125	0.2965	1.0000
Diagnostics of Multicollinearity										
VIF			1.4400	1.0500	1.2700	1.3300	1.2600	1.2900	1.3500	1.1800
Tolerance			0.6944	0.9524	0.7874	0.7519	0.7937	0.7752	0.7407	0.8475

Next, multicollinearity testing was performed. Multicollinearity testing uses several methods. The first way is to look at the correlation between the independent variables. As a cut-off, the opinion of Brooks (2019) is used which states that if the correlation between independent variables is more than 0.80, it should be suspected that there is a multicollinearity problem. From table 2, it can be seen that there is no correlation between independent variables greater than 0.8. The second way is with the VIF value. The free variable has a multicollinearity problem if the VIF is more than 10 (Brooks, 2019). Table 2 shows that all variables that are free of VIF values do not exceed 10 and Third Way, looking at the Tolerance value. If the Tolerance value is close to 0, it means that there is a multicollinearity problem, the analysis results show that all variables are free of the Tolerance value well above 0. Of the three methods, it is consistent that there is no problem of multicollinearity.

Tabel 4. Results of Research Model Analysis

	ROA		**NIM**		
Variables	Coef.	Prob.	Coef.		Prob.
Lag.var	0.0750	0.0000***	0.5920		0.0000***
car	-0.0119	0.0000***	0.7496		0.0000***
L.car			-0.5466		0.0000***
L2.car			0.2465		0.0000***
L3.car			-0.1094		0.0000***
oeoir	-0.0727	0.0000***	0.0864		0.0000***
ldr	0.0051	0.0000***	-0.0657		0.0000***
lta	0.0198	0.3420	1.6561		0.0000***
npl	-0.0698	0.0000***	0.3202		0.0000***
gpdrb	-0.0167	0.0000***	0.3140		0.0000***
birate	-0.0793	0.0000***	1.3771		0.0000***
inflasi	0.0138	0.0000***	-0.0534		0.4140
constanta	7.6040	0.0000***	-48.9958		0.0000***
Wald Test					
Wald chi2		1.95E+06			2.27E+06
Prob > chi2		0.0000***			0.0000***
Sargan test					

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chi2(65)		30.17537			30.28855
Prob > chi2		0.9999			0.9949
Abond test					
	z	Prob	z		Prob
m1	-2.2542	0.0242**	-2.0853		0.0370**
m2	-0.4321	0.6657	-1.4161		0.1567
OLS					
L.roa	0.1501	0	0.6216		0.0000***
Fixed-effects					
L.roa	0.0714	0.005	0.2988		0.0000***

Significance levels are : * p<0.10, ** p<0.05, *** p< 0.01

Table 3 shows the results of the analysis with variable ROA and NIM using the GMM model. In table 3, it can be seen that the ROA model and the NIM model, the Wald chi2 value is 1.95E+06 with a probability of 0.000 and the NIM model has a Wald Chi2 value of 2.27E+06 with a mean probability of 0.000 mean is significant at the level of 1%, so it is concluded that there is a significant relationship between the dependent and independent variables used in this study. The chi2 value in the Sargan test is equal to 30.17537 with a probability of 0.9999 for the ROA model and 20.28855 and a probability of 0.9949, indicating that the validity of the instrument meets the restriction conditions that identify excess. The autocorrelation test used Arellano Bond, the results were consistent because there was an autocorrelation on the *first difference error of order 1* (in other words Minus Ho for m1) and there was no autocorrelation on the error of the first difference on the error of the first order of difference (accept Ho for m2), d) The results of this analysis showed that the results were unbiased because the lag coefficient of ROA was equal to 0.0750 between the Lag coefficient of Fixed Effect ROA (0.0714) and OLS (0.1501). Meanwhile, the NIM lag coefficient is equal to 0.5920, between the ROA Fixed Effect (0.2988) and OLS (0.6216) lag coefficients.

Table 3 describes the data analysis using the two-step GMM system. These results are in line with the study of Sarkar and Rakshit (2024) where Lag.ROA and Lag NIM were significantly positive with a smaller ROA coefficient Lag value compared to Lag NIM. The positive coefficient of the profitability measure signifies the persistence of profits. Furthermore, Sarkar and Rakshit (2024) stated that the persistence of low ROA variables indicates that ROA variables in conventional banks in Indonesia tend to fluctuate. Such volatility is likely to be the result of the interest income component. Revenues derived from fee-based services, such as transaction fees, asset management fees, and trading profits, which fluctuate dramatically as the economy evolves will also affect volatile ROAs. Such an unstable ROA will result in significant increases and decreases in ROA. In addition, non-interest costs, including staff, marketing, and other operational costs, will adjust quickly in response to changes in profitability or market pressures. Management's ability to make quick adjustments contributes to volatile ROAs.

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will also affect volatile ROAs. Such an unstable ROA will result in significant increases and decreases in ROA. In addition, non-interest costs, including staff, marketing, and other operational costs, will adjust quickly in response to changes in profitability or market pressures. Management's ability to make quick adjustments contributes to volatile ROAs.

In contrast, large values of the NIM lag variable indicate high persistence. It is likely that this is due to significant structural inertia in the banking business model. This phenomenon arises as a result of the transmission of slow and asymmetrical interest rate changes due to the lending and deposit interest rate policy carried out by bank management. In addition, banks essentially practice maturity transformation that is, funding long-term assets (e.g., loans) with short-term liabilities (e.g., deposits). Meanwhile, fixed-rate assets take longer to revalue, creating a structural pause in interest income adjustments.

The results of this study show that the influence of the Capital Adequacy Ratio (CAR) variable on the ROA variable is not in accordance with what is expected by the hypothesis. In theory, the higher the value of the CAR, the safer the bank will be from the possible risk of default. However, in practice, a high CAR will be able to lower the ROA due to overcapitalization, where large capital cannot always be optimized by management to generate profits. In addition, if banks are too conservative in distributing credit, it will cause the value of productive assets to decrease, resulting in a decrease in return on assets (ROA). According to the regulatory buffer effect theory, banks tend to hold back credit expansion to keep the value of the CAR in line with regulations. The results of this study, in accordance with this study, are in line with Gazi et al. (2024), Macenning, et al. (2023). The influence of the CAR variable on NIM, hypothesized, has a positive and significant effect on NIM. This is likely due to the high trust of investors in conventional banks and the credit efficiency that is successfully executed by the bank's management. Banks with strong capital will be more trusted by customers, so they can distribute loans with higher interest rates and lower risks. Additionally, a high CAR tends to signal that banks have a more efficient fee structure, thereby increasing net interest margins.

The results of the analysis show that this study provides interesting insights, as the influence of the CAR variable on the term NIM changes over time. In this case, Demirguc-et al. (2020) with the Intertemporal Adjustment Theory explain that this, likely due to the impact of bank capital on interest margin performance (NIM), has an indirect effect, but there is a time lag because the process of credit distribution and portfolio restructuring takes time. This suggests that the relationship between CAR and NIM is not static, but rather evolving as their credit strategies adjust over time.

The influence of the Operating Expense to Operating Income Ratio (OEOIR) variable on bank profitability also showed mixed results. The ratio of Operating Expenses to Operating Income is in accordance with the hypothesis, which has a significant negative effect on ROA, but a significant positive on NIM. This is because the increase in the Ratio of Operating Expenses to Operating Income is faster when compared to the increase in ROA, as a result of which the company's profits will be eroded so that the ROA will decrease, this is in line with research (Mirovi´ et., al., 2024), Sarkar and Rakshit, 2024), Macenning et al. (2023). Meanwhile, the positive and significant influence of BOPO on NIM is due to the trade-off between risk and profit. NIM is measured from net interest income divided by average productive assets. The increase in OEOIR could be the result of investments that increase interest income. To achieve higher NIMs, banks often have to increase operating costs. For example, banks invest heavily in skilled salespeople (high salaries and commissions), advanced technology for credit analysis, or an extensive branch network to reach more customers, where these costs increase OEOIR.

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The results of the analysis showed that the influence of the LDR variable was positive and significant on the ROA variable (Gazi et al., 2024), Sukmaningrum et al. (2020), Macenning, et al. (2023), in accordance with the hypothesis, but significantly negative on NIM. This is likely to happen because the increase in LDR which reflects the optimization of the use of idle funds that the bank has successfully collected, directly contributes to the increase in the company's profit in this case, ROA. As for NIM, the likelihood of conventional bank LDRs is high because banks have channeled almost all deposits (Third-Party Funds) to finance loan growth, so banks are forced to look for alternative sources of funding such as interbank loans or the issuance of debt instruments. This source of funding has a higher rate than the interest paid to depositors, thus increasing the overall interest burden, resulting in the interest burden being depressed.

The influence of variable NPL on ROA, according to the hypothesis, is negative significant, but on NIM has a significant positive effect. As is known, the NPL variable is the ratio of non-performing loans or financing to total loans disbursed, reflecting the proportion of defaulted or uncollectible loans within a certain time limit. Bank Indonesia and the Financial Services Authority (OJK) limit the NPL rate to a maximum of 5%, where a ratio above this figure indicates high risk and declining asset portfolio quality. Increasing NPLs mean that the larger portion of the loan portfolio that does not generate interest income is increasing, resulting in a decrease in the bank's net profit. In theory, the increase in non-performing loans reduces interest income, encourages the formation of loss reserves (CKPN/PPAP), and increases the burden of operating costs. High reserve costs to cover potential credit losses cause profit before tax to drop significantly, which directly impacts ROA.

Meanwhile, the positive and significant influence of NPL variables on NIM, when viewed from the operational aspect, the risk-adjusted pricing policy is actively carried out by bank management to cover potential losses from non-performing loans. In addition, credit portfolio management, postponement of Write-Off, Restructuring and Refinancing.

The results of this study are in accordance with the hypothesis proposed, namely that there is a positive relationship between the variable total assets and the profitability of the bank represented by ROA and NIM. According to Berger and Bouwman (2013), (Tregenna (2009) due to economies of scale and operational efficiency. diversification as well as market strength and the advantages of conventional banks in pricing. Furthermore, Demirgüç-and Huizinga (2010) stated that, large banks have a cost advantage in funding, so they are often dubbed "too big to fail,". This perception lowers the level of perceived risk in the eyes of depositors and debt holders. As a result, large banks can raise funds (especially third-party funds and wholesale funding) at lower interest rates than smaller banks. Lower interest expense directly widens net interest margins. In addition, major banks are able to invest in advanced risk management technology, data analytics, and expert credit teams (Maudos, 2020). This study is in accordance with the hypothesis, namely the negative relationship between interest rate and ROA. Sukmaningrum et. al., (2020), Sarkar and Rakshit (2024), but positively related to NIM.

The positive relationship between interest rates and CARs is likely to increase the interest burden on borrowers (both companies and households), thereby reducing their capacity to pay.

While the positive relationship between interest rates and NIM is mainly explained by asymmetry in interest rate pass-through on bank assets and liabilities, as banks often adjust the interest rate on loans (assets) to the increase in the benchmark interest rate than the interest rate they pay on deposits (liabilities) (Borio et al., (2017). Banks should anticipate this by increasing this by increasing theprovision for loan losse*s* or allowance for the elimination of

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productive assets (PPAP). This increase in PPAP directly reduces net income, which is the numerator in ROA.

The finding that GDP growth has a positive influence on Return on Assets (ROA) but a negative influence on Net Interest Margin (NIM) is not only plausible but also well documented in the banking literature. This divergence arises because ROA and NIM capture different dimensions of profitability, and the economic cycle affects the underlying components of these metrics in different ways. ROA is a broad measure of overall profitability, calculated as Net Profit/Total Assets. GDP growth drives ROA through several powerful channels that increase revenues and reduce costs and risks Messai and Jouni (2013), Dietrich and Wanzenried (2014). NIM measures the core efficiency of financial intermediaries, calculated as **(**Interest Income - Interest Expense) / Average Income Assets. The negative relationship with GDP growth is mainly driven by competitive pressures and changing funding conditions. (Claessens et al., 2018))

Inflation is positive with ROA, negative NIM ((Mirovi'c et al., 2024), Sukmaningrum et al., (2020). The finding that inflation has a positive influence on Return on Assets (ROA) but a negative influence on Net Interest Margin (NIM) is a sophisticated result that touches on the core of how banks operate in a dynamic macroeconomic environment. This divergence can be explained by distinguishing between *face and real* value, and by understanding the various components that drive each profitability metric. ROA is a broad measure of overall profitability (Net Profit/Total Assets). Inflation can boost ROA through multiple channels that increase nominal income faster than nominal costs. NIM measures the core efficiency of financial intermediation (Net Interest Income / Average Income Assets). Negative relationships arise when the mechanisms that help ROA begin to reverse or are defeated by other factors, especially in a high or volatile inflationary environment.

Conclusion

This study, which uses *the Dynamic Panel Data* (GMM) method on conventional banks in Indonesia from 2012 to 2024, successfully confirms the persistence of **profitability** in Indonesia's conventional banking sector. This can be seen that the ROA Lag and NIM Lag are significantly positive. However, there are indications that the persistence of the NIM variable is greater than that of ROA, which is triggered by fluctuations in the interest income component and non-interest operating expenses.

The main findings show that there is a divergent impact of internal and macroeconomic factors on the two profitability proxies, namely ROA and NIM. The Capital Adequacy (CAR) variable shows an ambiguous relationship; while high CARs can increase stability and confidence, excessive CARs have the potential to lower ROAs because they encourage overly conservative or inefficient asset allocations. However, a strong CAR remains important for NIMs because it enhances the bank's ability to attract funding at lower costs. The CAR variable has a negative effect on ROA and positive NIM. An interesting finding from this study is that the influence of CAR on NIM changes, this is explained by Demirguc-et al. (2020) with Intertemporal Adjustment Theory.

The OEOIR (Operational Efficiency Ratio) variable has a negative impact on ROA, but positive on NIM, indicating a trade-off where banks incur high operating costs to achieve greater interest income. The LDR variable shows a nonlinear relationship; An optimal LDR increases ROA and NIM by maximizing the use of savings funds to generate interest income. However, LDRs that are too high can increase liquidity risks and additional funding costs, which can ultimately depress profitability.

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The Bank Size (LTA) variable is likely to increase ROA and NIM, taking advantage of economies of scale, diversification, and lower funding costs, although the evidence leans toward stronger benefits for larger institutions. The NPL (Non-Performing Loan) variable has a negative and significant effect on ROA, in line with the hypothesis that bad loans erode profits. Surprisingly, NPLs show a positive and significant influence on NIM.

Macroeconomic factors show complexity: GDP growth positively supports ROA amid reduced risks and increased demand, but can narrow NIM through stiff competition; inflation increases ROA through nominal earnings gains but erodes NIM in a volatile environment; interest rates negatively impact ROA by increasing the risk of default while expanding NIM through asymmetric interest rate adjustments.

Suggestion

Banks should keep LDRs at an optimal level (between 78% and 92% as per regulations) to maximize ROA, but with priority on raising low-cost Third Party Funds (DPK) to reduce interest burdens, so as to overcome the negative impact of NIM.

Given the significant negative impact of NPLs on overall profitability, bank management must consistently strengthen credit risk management processes to ensure asset quality and minimize losses due to bad loans

Banks should invest in diversifying non-interest income sources (such as *fee-based income* from transaction services or asset management) to reduce ROA volatility and improve long-term profit stability.

Regulators should pay more attention to the core of NIM intermediation, not just ROA. Meanwhile, investors should conduct a profitability duality analysis, which is the balance between ROA as a measure of total profit and NIM as a measure of efficiency.

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