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The Effect of the Allowance for Impairment Losses (CKPN) and Net Interest Margin (NIM) on Profitability, with Bank Size As a Moderating Variable, in Banks Listed on the Indonesian Stock Exchange (2021-2024)

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ABSTRACT

The degree to which banks generate earnings stands as a consequential barometer of the enduring viability of financial intermediation and the robustness of the monetary ecosystem as a whole. Among Indonesian depository institutions, a discernible upswing in profitability has been charted in the post-pandemic era, corroborated by a successive appreciation in Return on Assets (ROA) throughout 2021 to 2024. Notwithstanding this affirmative trajectory, the governance of credit deterioration and the calibration of net interest revenue remain persistent impediments confronting the industry. Accordingly, this inquiry is undertaken to scrutinize the extent to which the Allowance for Impairment Losses (CKPN) and Net Interest Margin (NIM) exert bearing upon ROA, with a concomitant examination of whether institutional magnitude functions as a moderating variable within these nexuses, as observed across bourseenlisted banking entities in Indonesia spanning the quadrennial interval of 2021 through 2024. Secondary data culled from the annual and financial disclosures of banking institutions constitute the empirical bedrock of this inquiry. Panel data regression serves as the principal analytical apparatus, encompassing descriptive statistics, model adjudication protocols, namely the Chow and Hausman tests, and classical assumption diagnostics. Empirical evidence reveals that CKPN and NIM each exert a discernible bearing upon ROA. Of particular salience is the moderating comportment of institutional magnitude, which attenuates the influence of CKPN on ROA whilst concurrently amplifying that of NIM. These revelations underscore the imperativeness of judiciously equilibrating risk-contingent provisioning directives and interest margin stewardship, with due cognizance of bank scale, in perpetuating sustainable profitability.

Keywords: Allowance for Impairment Losses (CKPN), Bank Size, Banking Sector, Net Interest Margin (NIM), Return on Assets (ROA).

1. INTRODUCTION

The banking sector plays a central role in modern economic life, encompassing functions such as transactions, deposit-taking, lending, and investment management. Furthermore, the banking sector acts as an intermediary institution that pools and channels public funds to support the economy (Listri, 2021). Strong banking performance is crucial as it is directly linked to enhancing corporate value and investor welfare. Consequently, banks are required to maintain their performance and sustainably increase their business value.

One of the key indicators in assessing banking performance is profitability. In the wake of the COVID-19 pandemic, the banking sector has faced challenges in maintaining profit stability, marked by an increase in Non-Performing Loans (NPLs) which have driven the formation of the Allowance for Impairment Losses (AIL) (Sihombing & Marbun, 2022), as well as pressure on interest income due to credit restructuring policies (Hamidah et al., 2023). Nevertheless, efficiency efforts through digitalisation have begun to yield positive impacts on profit growth (Maharani & Daljono, 2023). Return on Assets (ROA) serves as a key indicator in measuring a bank's ability to generate profit from its assets (Bunadi & Tarjo, 2022). Data indicates that the

banking sector's ROA in Indonesia increased during the 2021-2023 period before declining slightly in 2024, in line with improvements in asset quality reflected by the decline in NPLs.

In the context of risk management, the Credit Loss Provision (CLP) serves as a reserve to anticipate potential credit losses and is regulated under POJK No. 40/POJK.03/2019 and SEOJK No. 34/SEOJK.03/2021, which adopt PSAK 71 using the expected credit loss (ECL) approach. This approach requires banks to make provisions more proactively from the outset of financial asset recognition (Goncharenko & Rauf, 2024). An increase in the CKPN tends to have a negative impact on profitability as it reduces profit (Pramestika & Muchlis, 2023). Conversely, the Net Interest Margin (NIM), an indicator emblematic of a bank's capacity to yield net interest revenue, manifested a comparatively steadfast trajectory throughout the 2021-2024 interval, notwithstanding a marginal retrenchment observed in the concluding year.

Previous research findings have been mixed. NPLs have been shown to have a negative impact on ROA (Kasanah et al., 2022; Maulidha & Kusumah, 2023; Prena & Nareswari, 2022; Sihombing & Marbun, 2022), yet some studies found no significant effect (Hamidah et al., 2023; Limbong & Diana, 2023). Meanwhile, NIM has generally been shown to have a positive effect on ROA (Chukwuogor et al., 2021; Das Gupta et al., 2021; Hutabarat et al., 2022; Indrawan & Kaniawati Dewi, 2020; Nurwulandari et al., 2022; Putri & Dana, 2018; Rifansa & Pulungan, 2022; Surtikanti et al., 2022), although the degree of influence varies.

Such divergent outcomes lay bare an identifiable gap in the extant literature, intimating that the nexus between CKPN, NIM, and institutional profitability has yet to attain a definitive degree of consonance. Furthermore, there is still a limited number of studies that include bank size as a moderating variable, even though bank size has the potential to influence the ability to manage risk and operational efficiency (Amilla & Viverita, 2024; Dewi et al., 2021; Hasan et al., 2020; Maharani & Daljono, 2023; Maudi et al., 2020; Rachman et al., 2023; Sakti & Rachmawati, 2024; Shahabuddin et al., 2024; Zamzam & Suryaningprang, 2024). Furthermore, most previous studies focused on the period before or during the pandemic, so few have examined the period following the full implementation of PSAK 71.

Premised upon this backdrop, the present inquiry is undertaken with the cardinal objective of interrogating the bearing exerted by the Allowance for Impairment Losses (CKPN or AIL) and Net Interest Margin (NIM) upon Return on Assets (ROA), whilst concomitantly probing the moderating incumbency of institutional magnitude within said relationships, as circumscribed to bourselisted banking entities on the Indonesia Stock Exchange across the 2021-2024 quadrennium.

2. LITERATURE REVIEW

2.1. The Impact of the Allowance for Impairment Losses (AIL) on ROA

The Allowance for Impairment Losses (AIL) is a key component of banking credit risk management. An increase in the AIL reflects a bank's anticipation of potential future credit losses; however, allocating a larger amount of funds to the AIL can reduce net profit, thereby leading to a decline in Return on Assets (ROA). The inquiry conducted by Maulidha and Kusumah (2023) illuminates the ramifications of enacting Financial Accounting Standards Board (FASB) Statement 71 upon banks' fiscal performance and capital adequacy ratios. By enshrining the Expected Credit Loss (ECL) approach, FASB Statement 71 compels institutions to substantially augment their allowance for loan reserves. Their findings revealed that the promulgation of PSAK 71 precipitated a 50% escalation in ECL alongside a 5% erosion of the Capital Adequacy Ratio (CAR), collectively bearing down upon and diminishing bank profitability, ROA inclusive. Such revelations resonate with the antecedent findings of Sihombing and Marbun (2022), who posited that a pronounced surge in ECL curtails a bank's net earnings, thereby depressing ROA. Corroboratively, Kasanah et al. (2022) ascertained that CKPN exerts a statistically consequential adverse bearing on ROA across both conventional and Islamic banking institutions in Indonesia. In consonance, Prena and Nareswari (2022) similarly substantiated that an upswing in CKPN precipitates a deterioration in banking profitability.

Conversely, divergent conclusions were yielded by Limbong and Diana (2022) and Hamidah et al. (2023), whose investigations discerned no statistically appreciable bearing of CKPN upon ROA, particularly throughout the credit restructuring epoch engendered by the COVID-19 pandemic. Synthesizing these cumulative findings, it is discernible that an accretion in the Allowance for Impairment Losses (CKPN) tends

to impinge upon a bank's ROA. Predicated upon this evidentiary foundation, the ensuing hypothesis is hereby propounded:

H1: The Allowance for Impairment Losses (CKPN) has a significant negative effect on Return on Assets (ROA).

2.2. The Effect of NIM on ROA

The Net Interest Margin (NIM) is one of the key indicators of a bank's effectiveness in generating net interest income from its earning assets. A high NIM indicates greater efficiency in asset management, which directly contributes to an increase in the bank's profits and ultimately enhances profitability, as measured by ROA. Across a constellation of antecedent investigations, NIM has been recurrently demonstrated to wield a meaningfully affirmative bearing upon bank profitability. Rifansa and Pulungan (2022) corroborated that NIM exerts a salutary effect on ROA, intimating that an accretion in net interest revenue redounds directly to a bank's net earnings, thereby fortifying its profitability. This stance finds further anchorage in the revelations of Hutabarat et al. (2022), who affirmed a statistically consequential and affirmative association between NIM and ROA among state-owned banking institutions enlisted on the Indonesia Stock Exchange. Consonant with this trajectory, Sugiantari and Dana (2019) probed the bearing of the Loan to Deposit Ratio (LDR), NIM, and inflationary pressures upon profitability, operationalized through ROA, at PT Bank Pembangunan Daerah Bali spanning the 2009-2017 interval. The resultant evidence substantiated that NIM exerts a positive and statistically significant sway over ROA, intimating that an upswing in NIM directly galvanizes the institution's profitability.

Another study by Surtikanti et al. (2022) reinforces these findings, concluding that an increase in NIM significantly enhances the bank's profitability, as reflected in ROA. Furthermore, research by Indrawan and Dewi (2020) also demonstrates that an increase in NIM is strongly correlated with an increase in ROA, whereby efficiency in generating net interest income directly boosts the bank's net profit and improves profitability indicators. Mardillasari et al. (2021) further emphasise that NIM is an indicator that has a positive influence on profitability, particularly in measuring the efficiency of bank management in managing productive assets that generate interest income.

Cognate research undertaken by Nurwulandari et al. (2022) divulged that NIM impinges upon ROA, whilst operational efficiency, operationalized through the Operational Expense Ratio (OER), similarly bears upon profitability. This inquiry further accentuates the indispensability of Good Corporate Governance (GCG) as a reinforcing conduit between risk determinants and profitability, with sound governance demonstrated to buttress the affirmative bearing of NIM on ROA whilst concurrently augmenting institutional competitiveness.

Venturing beyond domestic frontiers, Chukwuogor et al. (2021) ascertained that NIM, loan loss reserves, and non-performing loans collectively impinge upon ROA. Their assertions underscored that an escalation in NIM propels a corresponding ascent in ROA, whereas an accretion in loan loss reserves exerts a deleterious drag on profitability. Such revelations reinforce the canonical tenets of banking theory, wherein net interest margin efficiency is enshrined as a pivotal determinant of profit-generating capacity, whilst burgeoning loan loss reserves are emblematic of heightened credit risk that suppresses net earnings. Complementarily, Das Gupta et al. (2021) interrogated the interrelationships among financial intermediation expenditures, risk, and banking efficiency in Bangladesh via a Two-Step System GMM framework, discerning that elevated intermediation costs, manifested through a subdued NIM, bear an adverse correlation with bank profitability, and that operational efficiency alongside institutional magnitude moderate the nexus between risk and net interest income.

Based on the results of the previous studies, the general consensus is that NIM influences ROA. Therefore, the following hypothesis is proposed in this study:

H2: Net Interest Margin (NIM) has a significant positive effect on Return on Assets (ROA).

2.3. Bank Size Moderates the Effect of CKPN on ROA

The Credit Risk Provision (CKPN) is a key indicator of a bank's prudence in managing credit risk. However, an increase in the CKPN can reduce net profit and lead to a decline in Return on Assets (ROA). Nevertheless, not all banks experience the same impact of an increase in the CKPN on their ROA. One factor that can influence this relationship is the size of the bank.

Bank size mitigates the negative impact of the CKPN on ROA because large banks possess a thicker capital buffer, a more diversified portfolio, and access to cheaper and more stable funding. Within the framework of PSAK 71, the risk modelling capabilities of large banks (e.g. PD-LGD-EAD calibration and credit staging) are generally more mature, meaning fluctuations in ECL are better managed. Consequently, an increase in CKPN at large banks reduces ROA by a relatively smaller margin compared to small and medium-sized banks;

Bank size also reflects a bank's operational scale, asset capacity, and financial resilience. Large banks tend to have advantages in terms of risk diversification, operational efficiency, and the ability to absorb losses. Thus, large banks are generally able to withstand the negative impact of rising CKPN on profitability. Conversely, small banks are more vulnerable to such pressures due to limitations in capital structure and operational resources. Thus, bank size has the potential to act as a moderating variable in the influence of NPLs on ROA.

Other studies have examined different sets of variables, yet the results reveal a similar pattern: according to Amilla and Viverita (2024) on the banking sector in ASEAN during the COVID-19 pandemic, bank size significantly moderates the relationship between financial health indicators (CAR, NPL, BOPO, LDR) and ROA and NIM. This is consistent with the research by Rachman et al. (2023), which found that CAR, NPL, and BOPO influence ROA, moderated by bank size, whilst DER has no effect.

Research providing direct evidence for the proposed hypothesis comes from Sakti & Rachmawati (2024), which discusses how the Allowance for Impairment Losses (AIL) influences ROA, though this effect may be influenced by bank size. Therefore, the following hypothesis is proposed in this study:

H3: Bank size weakens the effect of the Allowance for Impairment Losses (CKPN) on Return on Assets (ROA).

2.4. Bank Size Moderates the Effect of NIM on ROA

NIM stands as a cardinal barometer of banking intermediation efficacy in yielding net interest revenue from the differential between lending and deposit rates. It is theoretically posited that an upswing in NIM amplifies the prospective net earnings extractable from credit disbursement activities, thereby exerting an affirmative bearing upon ROA as the preeminent gauge of institutional profitability. However, the effect of NIM on ROA is not always linear and can be influenced by specific bank characteristics, particularly bank size. Large banks generally possess advantages in terms of economies of scale, cost efficiency, and a more stable funding structure. This enables them to utilise the interest margins they generate more effectively to enhance profitability. Conversely, small banks may face constraints in converting NIM into high profits due to limitations in operational efficiency and scale.

Previous research has examined different variable contexts, yet the results indicate a consistent pattern: bank size moderates the relationship between income diversification and financial stability (Chowdhury et al., 2024). Meanwhile, research by Hasan et al. (2020) specifically tested the role of bank size as a moderating variable in the relationship between NIM and profitability. Although the interaction between NIM and bank size did not affect ROA, this study revealed a direction of relationship that is theoretically plausible and opens up scope for further exploration. These results indicate that bank size retains the potential to act as a factor that either strengthens or weakens the relationship between NIM and ROA, depending on each bank's internal conditions and strategies.

More direct empirical support is provided by Zamzam and Suryaningprang (2024), who studied PT Bank Tabungan Negara Tbk over the period 2010-2022. The results indicate that NIM influences ROA and that bank size is capable of both moderating and strengthening the effect of NIM on ROA. These findings confirm that banks with larger asset sizes tend to possess better capacity for managing productive assets, funding structures, and intermediation efficiency, thereby enabling the benefits of an increase in NIM to be more effectively translated into improved profitability.

Compounding this, scholarly inquiry explicitly interrogating the moderating incumbency of institutional magnitude within the nexus between NIM and ROA remains conspicuously sparse, particularly as circumscribed to the conventional banking landscape of Indonesia. Predicated upon this evidentiary lacuna, the ensuing hypothesis is hereby propounded:

H4: Bank size strengthens the effect of the Net Interest Margin (NIM) on Return on Assets (ROA).

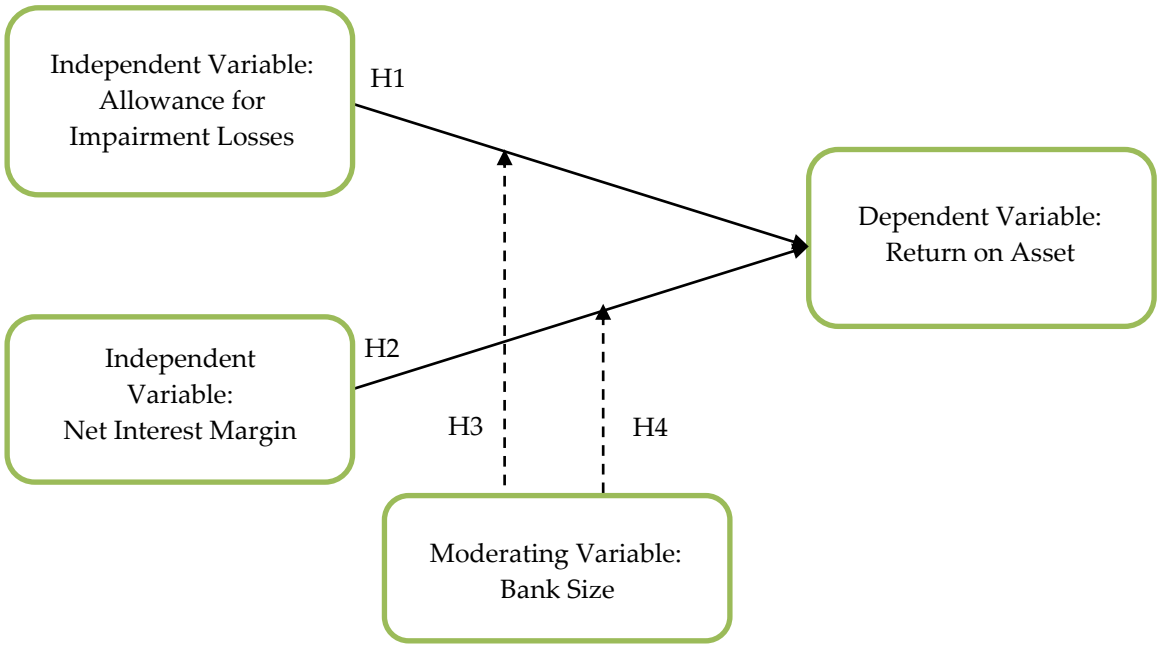

Figure 1. Conceptual Framework of the Study
Source: Adapted by the author (2024)

3. RESEARCH METHODS

This study employs a quantitative approach with a causal design to examine the influence of the Allowance for Impairment Losses (AIL) and the Net Interest Margin (NIM) on Return on Assets (ROA), with Bank Size serving as a moderating variable. The data used consists of panel data (a combination of cross-sectional and time-series data) covering the period 2021-2024. The units of analysis are bourselisted banking institutions on the Indonesia Stock Exchange (IDX) falling within the IDX Finance classification, with the study populace encompassing all IDX-enlisted banks throughout the observation interval. Purposive sampling was enlisted as the specimen selection mechanism, governed by the following stipulations: (1) uninterrupted publication of financial disclosures spanning 2021-2024, (2) availability of exhaustive data pertaining to CKPN, NIM, ROA, and total assets, (3) abstention from mergers, acquisitions, or delisting throughout the observation window, and (4) possession of consequential total assets. Adherence to these stipulations yielded a cohort of 37 institutions, culminating in 148 observational units. Secondary data were procured via documentary extraction from annual financial disclosures disseminated on the IDX and the respective institutions' official digital repositories.

The investigative variables are stratified as follows: (1) the dependent variable, profitability proxied through ROA; (2) the independent variables, CKPN and NIM; and (3) the moderating variable, institutional magnitude, operationalized via the natural logarithm of total assets. CKPN is gauged through its ratio to productive assets, whilst NIM is computed as the proportion of net interest revenue relative to productive assets. Analytical procedures were executed through Microsoft Excel and Stata 13, encompassing: descriptive statistical appraisal; adjudication of panel data regression model specifications; Pooled Least Squares, Fixed Effects, and Random Effects; via the Chow, Hausman, and Lagrange Multiplier tests; and a battery of classical assumption diagnostics, including normality, multicollinearity, heteroscedasticity, and autocorrelation scrutiny. Hypothesis corroboration was effectuated through the F-test (simultaneous), t-test (partial), and the coefficient of determination (Adjusted R^2). The analytical framework enlisted was Moderated Regression Analysis (MRA), operationalized through the ensuing equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 Z + \beta_4 X_1 Z + \beta_5 X_2 Z + \varepsilon$$

where Y is ROA, X_1 is CKPN, X_2 is NIM, Z is bank size, and ε is the error term.

4. RESULTS AND DISCUSSION

4.1. Research Results

4.1.1. Description of the Research Subject

In this study, the data used are secondary data obtained from the financial statements and annual reports of all banks listed on the Indonesia Stock Exchange (IDX) for the period from 2021 to 2024. The research sample was selected using the purposive sampling method. The banks included in the sample were determined based on criteria established by the author. A summary of the sample selection procedure is presented in the table 1.

Table 1. Sampling Criteria

Criteria	Number of Companies
Companies included in the index from 2021 to 2024	44
Excluded:	
Companies experiencing status changes (mergers, acquisitions, delisting)	-7
Total Companies	37
Total Observations over 4 years	148

It is noted that the population used in this study comprises 44 banks listed on the Indonesia Stock Exchange (IDX) between 2021 and 2024 and included in the IDXFinance index. During the period from 2021 to 2024, seven banks underwent changes in status, such as mergers and acquisitions; consequently, the sample size for this study was set at 37 banks, with an observation period spanning four years from 2021 to 2024. The total number of data points observed amounts to 148 (37 banks × 4 years).

4.1.2. Test of Classical Assumptions

Classical assumption diagnostics are undertaken to ascertain the appropriateness of enlisting a regression framework within this inquiry. These evaluations probe whether the data conform to the requisite classical stipulations, thereby warranting that the regression apparatus satisfies the criteria befitting a Best Linear Unbiased Estimator (BLUE). Such scrutiny is indispensable in circumventing biased estimations, given that regression methodology is not indiscriminately applicable across all data configurations. The classical assumption diagnostics employed in this investigation are delineated as follows:

a. Normality Test

Table 2. Results of the Shapiro-Wilk Normality Test

Variable	Obs	W	V	z	Prob > z
Residual	148	0.9831	1.940	1.501	0.0667

Source: Data processed by the author using Stata 13.0

The Shapiro-Wilk test outcomes tabulated in Table 2 yield a W-value of 0.9831 accompanied by a p value of 0.0667, surpassing the stipulated significance threshold of 0.05. Such results intimate that the null hypothesis asserting the normal distribution of residuals cannot be repudiated; it is therefore warranted to conclude that the normality assumption pertaining to residuals is duly satisfied. The fulfilment of this normality stipulation carries considerable consequence, as it safeguards the validity of hypothesis corroboration undertaken through the t-test and F-test apparatuses. A W-value close to 1 indicates that the distribution of the residuals is very close to a normal distribution, suggesting that the regression model used fits the data well and that there are no extreme outliers that could influence the estimation results.

b. Heteroscedasticity Test

Table 3. Results of the Breusch-Pagan Heteroscedasticity Test

Statistical Test	Value	Prob > chi2
chi2(1)	0.54	0.4637

Source: Data processed by the author using Stata 13.0

The Breusch-Pagan diagnostic in Table 3 yields a chi-square statistic of 0.54 accompanied by a probability value of 0.4637, exceeding the 0.05 threshold, thereby intimating the absence of any heteroscedasticity affliction within the model. This means that the residual variance is constant (homoscedastic), so that the

estimation of standard errors is efficient and hypothesis testing (t-tests) can be conducted validly. Furthermore, the stable error variance indicates the absence of any systematic pattern in the residuals, meaning the regression model is able to represent the relationship between variables effectively. The fulfilment of this assumption also ensures that the OLS estimator in the Fixed Effects Model is efficient with minimum variance.

c. Multicollinearity Test

Table 4. Results of the Multicollinearity Test (VIF)

Variable	VIF	1/VIF
NIM × Bank Size	3.98	0.2511
NIM	3.65	0.2738
CKPN × Bank Size	1.89	0.5285
Bank Size	1.51	0.6614
CKPN	1.50	0.6664
Mean VIF	2.51	

Source: Data processed by the author using Stata 13.0

The multicollinearity diagnostics presented in Table 4 reveal that all independent variables register VIF magnitudes below the 10 threshold, with the apex VIF recorded at 3.98 and the mean standing at 2.51, collectively intimating the absence of consequential multicollinearity affliction within the model. The corroborative evidence furnished by tolerance values uniformly surpassing 0.1 further substantiates that each variable retains sufficiently discernible variation. Although the NIM variable and its interaction with bank size have relatively higher VIF values, these conditions remain reasonable and within acceptable limits. Consequently, the regression model is deemed stable, allowing for accurate and reliable estimation of coefficients and hypothesis testing.

d. Autocorrelation Test

Table 5. Results of the Wooldridge Autocorrelation Test

Statistical Test	Value	Prob > F
F(1, 36)	0.881	0.3542

Source: Data processed by the author using Stata 13.0

The Wooldridge diagnostic in the Table 5 yields an F-statistic of 0.881 accompanied by a probability value of 0.3542, surpassing the 0.05 threshold, thereby intimating the absence of autocorrelation affliction within the model. This means that the classical assumptions are met, so the standard error estimates are reliable and the hypothesis testing is valid. Furthermore, the absence of autocorrelation indicates that the residuals across periods are not correlated with one another. Consequently, the model utilising the variables CKPN, NIM, Bank Size, and their interactions is deemed to have successfully explained the variation in ROA without any systematic error patterns over time.

4.1.3. Estimation of the Fixed-Effects Regression Model

Following the model selection test and classical assumption tests, the next step is to estimate the regression model using a fixed-effects model (See Table 6). The regression framework enlisted in this inquiry is Moderated Regression Analysis (MRA), operationalized through the ensuing equation:

$$ROA = 23.9541 + (-0.6468)\beta_1 + 0.6944\beta_2 + 0.6086\beta_3 + (-0.7256)\beta_4 + 0.9060\beta_5 + \varepsilon$$

Table 6. Results of the Fixed-Effects Regression Model

Variables	Coefficient	Std. Error	t	P>|t|	95% Confidence Interval
CKPN	-0.6468	0.0721	-8.97	0.000	[-0.7898, -0.5038]
NIM	0.6944	0.0701	9.91	0.000	[0.5555, 0.8334]
Bank Size	0.6086	0.0360	16.91	0.000	[0.5372, 0.6799]
CKPN × Bank Size	-0.7256	0.1337	-5.43	0.000	[-0.9907, -0.4604]
NIM × Bank Size	0.9060	0.2020	4,49	0.000	[0.5056, 1,3065]
Constant	23,9541	1,1239	21,31	0.000	[21,7258, 26,1824]

4.1.4. Model Statistics

Table 7. Model Statistics

Statistics	Value
R-squared Overall	0.5214
F-statistic	800.01
Prob > F	0.0000
Number of Observations	148
Number of Banks	37

Source: Data processed by the author using Stata 13.0

As evinced in Table 7, all independent variables exert a statistically consequential bearing upon ROA at the 5% significance threshold. The R-squared magnitude of 0.5214 intimates that 52.14% of the variance inherent in ROA is attributable to CKPN, NIM, institutional magnitude, and their concomitant interactions, whilst the residual 47.86% is ascribable to extraneous determinants. The model likewise attains overall statistical cogency ($F = 800.01$; $p = 0.0000$).

Upon partial scrutiny, CKPN manifests a statistically significant adverse bearing upon ROA, whilst NIM and institutional magnitude each exert a meaningfully affirmative influence. The interaction terms reveal that institutional magnitude attenuates the deleterious bearing of CKPN upon ROA, whilst concurrently galvanizing the salutary sway of NIM over the same metric. All outcomes attain significance at the 1% threshold, underscoring the robustness and consistency of the interrelationships among the enlisted variables.

a. Model Specification Test (F-Test)

The F-test is enlisted to ascertain whether the independent variables exert a statistically consequential simultaneous bearing upon the dependent variable. As evinced in Table 7, an F-statistic of 800.01 accompanied by a probability of 0.0000. falling beneath the 0.05 threshold, substantiates the overall statistical cogency of the regression model. This intimates that CKPN, NIM, institutional magnitude, and their concomitant interactions collectively wield a consequential and unified bearing upon ROA. Thus, the regression model used is valid and has good predictive power in explaining variations in bank profitability.

b. Individual Parameter Significance Test (T-Test)

The t-test was used to test the partial effects of the independent variables on ROA. The results show that all variables have a probability < 0.05, indicating they are significant. CKPN has a significant negative effect on ROA ($t = -8.97$; $p = 0.000$), whilst NIM ($t = 9.91$; $p = 0.000$) and bank size ($t = 16.91$; $p = 0.000$) have significant positive effects. The interaction between CKPN and bank size showed a significant negative effect ($t = -5.43$; $p = 0.000$), meaning that bank size weakens the negative effect of CKPN on ROA. Meanwhile, the NIM × bank size interaction has a significant positive effect ($t = 4.49$; $p = 0.000$), indicating that bank size strengthens the positive effect of NIM on ROA. Thus, all hypotheses in this study are supported by the data.

c. Coefficient of Determination (R-squared)

The coefficient of determination serves as an indicator of the model's aptitude in elucidating the variance inherent within the dependent variable. As evinced in Table 7, an R-squared magnitude of 0.5214 connotes that 52.14% of the fluctuation in ROA is explicable through CKPN, NIM, institutional magnitude, and their concomitant interactions, whilst the residual 47.86% remains ascribable to extraneous determinants lying beyond the model's purview. This magnitude is adjudged moderate yet tenable within the context of a fixed-effects framework, intimating that the model possesses a reasonably commendable capacity to elucidate the interrelationships between the enlisted variables and ROA.

4.2. Discussion

4.2.1. The Effect of the Allowance for Impairment Losses (AIL) on Return on Assets (ROA)

The outcomes of the inaugural hypothesis test reveal that AIL exerts a negative and statistically consequential bearing upon ROA, yielding a regression coefficient of -0.6468 alongside a p-value of 0.000. This finding intimates that a 1% accretion in the IALR precipitates a 0.6468% deterioration in ROA, under the ceteris paribus assumption that all extraneous variables remain invariant.

When examining the distribution of banks based on their ROA, the number of banks with a negative ROA in 2021 was 8 out of 37 banks, or approximately 21.62%. In 2022, this figure decreased to 4 banks or 10.81%, in 2023 to 1 bank or 2.70%, and in 2024 there were no longer any banks recording a negative ROA or 0.00%. Cumulatively, this indicates that out of a total of 148 bank observations for the 2021-2024 period, there were 13 observations with a negative ROA, or approximately 8.78%, whilst the remaining 135 observations, or 91.22%, still recorded a positive ROA. Thus, although the regression model indicates that CKPN has a negative impact on ROA across the entire research sample, the most pronounced manifestation of this impact in the form of negative profitability occurred only in a subset of observations, and its proportion continued to decline throughout the study period.

The decline in the percentage of banks experiencing negative ROA from 21.62% in 2021 to 0.00% in 2024 also suggests that the banking sector as a whole is experiencing a recovery in profitability performance. However, this result does not negate the significance of the regression findings, as the negative influence of CKPN on ROA remains statistically significant. This means that, although not all banks experienced negative ROA, an increase in CKPN still exerts downward pressure on banks' overall profitability levels. In this context, CKPN can be understood as a factor influencing the magnitude of profit generated on assets, rather than merely a factor causing banks to directly enter a loss-making condition. In other words, all banks in the sample were affected by the direction of the relationship, but the intensity of the impact varied between banks and across periods.

This negative effect is consistent with agency theory, which states that bank management, as agents, has a responsibility to manage credit risk by establishing adequate CKPN; however, high levels of CKPN reduce net profit and ultimately lower the bank's profitability. The findings of this study are also consistent with signalling theory, which states that high levels of CKPN can send a negative signal to investors regarding the quality of the bank's assets and future profitability prospects.

These revelations lend corroboration to the antecedent findings of Maulidha & Kusumah (2023), Sihombing and Marbun (2022), Kasanah et al. (2022), and Prena and Nareswari (2022), each of whom ascertained that CKPN exerts a statistically consequential adverse bearing upon institutional profitability. The negative impact of the provision for credit losses on ROA can be explained by the mechanism whereby the provision for credit losses constitutes a cost borne by the bank, which reduces pre-tax net profit. In the context of the implementation of PSAK 71, which adopts the Expected Credit Loss (ECL) model, banks are required to establish CKPN on a forward-looking basis from the initial recognition of financial assets, which tends to result in higher provision values compared to the incurred loss model under PSAK 55. A significant increase in CKPN resulting from the implementation of PSAK 71 may lead to a material decline in net profit, thereby having a negative impact on ROA.

4.2.2. The Effect of Net Interest Margin (NIM) on Return on Assets (ROA)

The outcomes of the second hypothesis test reveal that NIM exerts a positive and statistically consequential bearing upon ROA, yielding a regression coefficient of 0.6944 alongside a p-value of 0.000. This finding intimates that a 1% accretion in NIM precipitates a commensurate 0.6944% augmentation in ROA, under the ceteris paribus assumption that all extraneous variables remain invariant. This discussion is further reinforced by the trend in the average NIM over the study period, which rose from 4.72% in 2021 to 5.34% in 2022, then reached 5.75% in 2023, before declining slightly to 5.65% in 2024. This pattern indicates that, generally, banks' intermediation capacity tended to improve throughout the study period, although it experienced a slight correction in the final year. Furthermore, in each year of observation, 36 banks (approximately 97.30%) had a positive NIM, whilst only 1 bank (approximately 2.70%) had a negative NIM. This composition indicates that the majority of banks in the sample consistently generated positive net interest income, thereby making the regression results showing a positive influence of NIM on ROA increasingly plausible. Substantively, this finding confirms that NIM is one of the key determinants of banking profitability, as an increase in net interest income expands the profit margin and ultimately enhances the bank's ability to generate a return on its total assets.

This affirmative bearing finds consonance with Agency Theory, as the capacity to yield a net interest margin is emblematic of managerial efficacy in discharging intermediation incumbencies, stewarding the funding architecture, and judiciously allocating productive assets. The more adeptly management governs the differential between interest revenue and interest expenditure, the greater the quantum of profit extractable

from the institution's asset base. Through the prism of Signalling Theory, a buoyant NIM concurrently functions as an affirmative market signal, connoting commendable intermediation calibre, adequate funding management efficacy, and fortified profitability prospects. Accordingly, the affirmative bearing of NIM upon ROA corroborated in this inquiry substantiates that a bank's adeptness in stewarding interest margins not merely impinges upon near-term earnings, but equally serves as a reflection of institutional managerial calibre and competitive standing within the broader banking landscape.Sonnet 4.6

The findings of this study are consistent with the results of previous research conducted by Rifansa et al. (2022), Siregar (2022), Surtikanti et al. (2022), Sugiantari and Dana (2019), Indrawan and Dewi (2020), Nurwulandari et al. (2022), Chukwuogor et al. (2021), and Das Gupta et al. (2021), who found that NIM has a significant positive effect on bank profitability. The positive effect of NIM on ROA can be explained by the mechanism that an increase in NIM reflects an improvement in the bank's efficiency in generating net interest income from its productive assets. Banks that are able to set higher lending rates or secure lower funding costs will have a higher NIM, which will ultimately increase net profit and ROA. Furthermore, a high NIM also indicates that the bank possesses strong pricing power and sound management capabilities in managing the spread between interest income and interest expense.

In the context of the Indonesian banking sector during the 2021-2024 period, NIM has been a key factor supporting bank profitability amidst various post-COVID-19 economic challenges. Although there was pressure on interest margins due to loan restructuring policies and low interest rates at the start of the recovery period, banks that were able to improve operational efficiency and diversify their loan portfolios were able to maintain or even increase their NIM. An increase in NIM accompanied by an increase in ROA indicates that financial intermediation activities are the primary source of bank profitability; therefore, bank management needs to focus on optimising the management of productive assets and funding costs to improve financial performance. The findings of this study also provide practical implications that banks with high NIMs tend to have better profitability, so investors can use NIM as one indicator in assessing performance and investment prospects in the banking sector.

4.2.3. The Role of Bank Size in Weakening the Effect of the Allowance for Impairment Losses (AIL) on Return on Assets (ROA)

The results of the third hypothesis test indicate that bank size weakens the negative effect of the AIL on ROA, with a regression coefficient for the AIL × Bank Size interaction variable of -0.7256 and a probability value of 0.000. This finding indicates that the negative impact of ALR on ROA is weaker in larger banks. In other words, although an increase in ALR still reduces ROA, the reduction is not as significant as in smaller banks. Furthermore, the average bank size, proxied by total assets, increased consistently over the study period. The average total assets of the sample banks stood at 220.775,767 million in 2021, rising to 241,672,526 million in 2022, then rose further to 257,324,638 million in 2023, and reached 275,241,605 million in 2024. This increase indicates that, generally, the sample banks experienced year-on-year growth in business scale. This growth suggests an increase in operational capacity, intermediation capacity, and risk-absorption capability. In this context, banks with larger total assets tend to be better able to absorb the impact of CKPN formation without experiencing a significant decline in profitability. In other words, these results are consistent with the hypothesis that bank size mitigates the negative impact of CKPN on ROA.

The revelations of this inquiry resonate with the antecedent findings of Sakti & Rachmawati (2024), who ascertained that institutional magnitude moderates the nexus between credit risk determinants and banking profitability. The moderating incumbency of institutional magnitude in attenuating the deleterious bearing of CKPN upon ROA is explicable through several underlying mechanisms. The moderating incumbency of institutional magnitude in ameliorating the adverse bearing of CKPN upon ROA buttresses Agency Theory, specifically the proposition that organisational capacity governs management's aptitude in stewarding credit risk exposures. Banks with larger total assets are generally supported by stronger capitalisation, broader credit diversification, and more mature risk management systems, thereby enabling the impact of CKPN formation on profits to be better controlled. Within the framework of Signalling Theory, bank size also serves as a signal of fundamental strength, indicating that the bank possesses greater resilience in facing credit risk pressures. Thus, bank size is not merely a descriptive characteristic but a strategic factor influencing the extent to which credit risk translates into pressure on profitability.

In the context of the implementation of PSAK 71, which requires the formation of CKPN on a forward-looking basis based on Expected Credit Loss (ECL), large banks have an advantage in terms of risk modelling capabilities and more mature risk management systems. Large banks generally possess better human resources, information technology, and infrastructure to calibrate risk parameters such as probability of default (PD), loss given default (LGD), and exposure at default (EAD), thereby enabling more accurate credit staging and ECL calculations. Consequently, fluctuations in CKPN at large banks tend to be more manageable and less volatile compared to small banks, thereby minimising the negative impact on ROA. The findings of this study have practical implications: regulators should consider bank size characteristics when setting provisioning policies and credit risk supervision, whilst investors should regard bank size as a factor influencing the resilience of a bank's profitability against credit risk.

4.2.4. The Role of Bank Size in Amplifying the Effect of Net Interest Margin (NIM) on Return on Assets (ROA)

The outcomes of the fourth hypothesis test reveal that institutional magnitude amplifies the affirmative bearing of NIM upon ROA, yielding a regression coefficient of 0.9060 for the NIM × Bank Size interaction variable alongside a p-value of 0.000. This finding intimates that the salutary influence of NIM upon ROA is more pronounced among larger institutions. Stated differently, an accretion in NIM within larger banking entities precipitates a more substantial augmentation in ROA relative to their smaller counterparts. The mean NIM value of 5.37%, spanning a gamut from -4.14% to 27.55%, alongside a mean ROA of 0.89% and a discernible accretion in mean total assets from 220.775,767 million in 2021 to 275,241,605 million in 2024, collectively substantiate that larger institutions possess a more robust capacity to transmute net interest revenue into profitability. Accordingly, the outcomes corroborate the propounded hypothesis that institutional magnitude fortifies the affirmative bearing of NIM upon ROA, whereby greater institutional scale engenders a more potent influence of NIM in galvanizing banking profitability.

These revelations resonate with the antecedent findings of Zamzam and Suryaningprang (2024) pertaining to PT Bank Tabungan Negara (Persero) Tbk across the 2010-2022 interval, wherein institutional magnitude was demonstrated to partially moderate or buttress the bearing of NIM upon ROA. These findings reinforce Agency Theory, as larger banks generally possess better managerial capabilities, funding capacity, and operational efficiency in optimising productive assets. With a larger scale of operations, banks tend to have broader access to low-cost funds, a stronger business network, and better pricing capabilities, so that an increase in NIM can be translated into a more optimal increase in ROA. From the perspective of Signalling Theory, the combination of a high NIM and large bank size constitutes a positive signal regarding the bank's intermediation strength, funding efficiency, and profit prospects. Therefore, the results of this study indicate that bank size acts as a reinforcing factor that amplifies the economic benefits of the net interest margin on profitability.

In the context of the Indonesian banking sector during the 2021-2024 period, large banks such as the Himbara banks demonstrated more stable NIM performance and higher profitability compared to smaller banks, indicating that bank size is indeed a key factor in optimising the impact of NIM on ROA. The findings of this study have practical implications: large banks possess a competitive advantage in utilising the interest margin to enhance profitability; consequently, investors may wish to consider bank size as a key factor in investment decisions within the banking sector.

5. CONCLUSIONS

This inquiry substantiates that the loan loss provision (LLP) exerts a statistically consequential adverse bearing upon return on assets (ROA), whilst the net interest margin (NIM) conversely wields a meaningfully affirmative influence upon the same metric. Furthermore, institutional magnitude was ascertained to operate as a moderating conduit, simultaneously attenuating the deleterious bearing of LLP upon ROA whilst galvanizing the salutary sway of NIM over ROA. This indicates that an increase in ALR, as a form of credit risk provisioning, can suppress bank profitability, whilst an increase in interest income efficiency can drive improved financial performance. The role of bank size also suggests that the impact of these two variables is not uniform, but rather depends on the bank's operational scale.

The implications of these findings underscore the importance of strengthening credit risk management and optimising interest margin management strategies within the banking sector to maintain and enhance profitability. Investors should assess ROA more comprehensively by considering its determining factors, such as NIM and CKPN policies, whilst taking bank size into account when comparing performance. On the other hand, regulators are expected to continue promoting transparency and the quality of reporting regarding CKPN and NIM to maintain financial system stability. Further research is recommended to expand the variables, time periods, and research subjects to provide a deeper understanding of the determinants of banking profitability.

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