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Article

What Factors Determine Bank Profitability? Evidence from the Indonesian Banking Industry

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Abstract: Bank profitability is a relevant topic in financial economics, particularly in emerging markets. This study investigates the determinants of bank profitability in Indonesia over the 2011–2024 period, focusing on the underexplored segment of Primary Dealer banks. A Panel ARDL–PMG methodology is applied to a balanced panel of 13 banks over 14 years (2011–2024) to examine the long-run and short-run effects of macroeconomic and bank-specific variables on return on assets (ROA) and return on equity (ROE). The results identify operational efficiency (BOPO) and capital adequacy (CAR) as the dominant long-run determinants of bank profitability. A key asymmetry is observed in the NPL effect: while NPL consistently erodes equity returns (ROE), its effect on asset returns (ROA) is largely insignificant in most specifications and negative only when exchange rate controls are included. Among macroeconomic variables, the policy interest rate positively affects both profitability measures in the long run, while the exchange rate exhibits asymmetric effects across ROA and ROE. In the short run, internal bank factors dominate, with macroeconomic effects emerging predominantly over the long horizon. The paper contributes to the banking literature by highlighting asymmetric profitability dynamics within a dynamic panel framework and providing policy-relevant insights for bank management and financial regulatory authorities.

Keywords: Bank Profitability; Macroeconomic Factors; Bank-Specific Factors; Panel ARDL; Pooled Mean Group

1. Introduction

Bourke [1] and Athanasoglou et al. [2] argue that the profitability of banks is still a focus in the banking and financial economics study since it indicates the performance of the institutions, their stability in times of economic shocks, and the financial system stability in general. According to Schumpeter [3] and King and Levine [4], profitable banks are in a better position of absorbing the loss, continuing credit intermediation as well as promoting long-run economic growth due to effective financial intermediation. In emerging economies such as Indonesia, bank profitability attracts considerable attention because commercial banks dominate the financial system and constitute the main transmission channel for monetary policy and macroeconomic shocks [4],[5].

The Indonesian banking industry has evolved significantly since the Asian financial crisis of 1997-1998, which revealed structural weaknesses in capital adequacy, risk management, and regulatory oversight [6]. To counter the crisis, extensive changes were made to tighten prudential regulation and banking supervision in Indonesia. Monetary stability has since been largely ensured

through inflation control, central bank policy, interest rate and exchange rate stabilization [7]. It was also strengthened, and Law Number 21 of 2011 was passed, which officially took over the banking supervision functions as the Financial Services Authority in 2013 [8]. Muflikh & Baidhowi [8] suggest that these reforms have helped create a more resilient banking system, but, in any case, banking profitability remains subject to fluctuations in the macroeconomic environment. Even in this landscape, Primary Dealer (PD) banks with official entities of the Minister of Finance of the Republic of Indonesia for conducting official buying and selling of Government securities in the primary and secondary markets hold a special position because on the one hand their profitability depends on the dynamics of the sovereign debt market, the transmission of monetary policy and also the volatility of the macro-economic conditions, but on the other hand they have not been studied in detail as a segment.

Empirical evidence suggests that the profitability of Indonesian commercial banks has been relatively stable during the period of observation, even amid significant macroeconomic volatility. The Financial Services Authority indicated that the overall ROA of Indonesian commercial banks from 2011 to 2024 was about 2.59 percent, but it decreased significantly during the COVID-19 pandemic in 2020 [9]. The relative stability has been paralleled by high volatility in inflation rates, policy interest rates, and exchange rates, which indicates that the profitability of banking in Indonesia is influenced by both external macroeconomic conditions and internal managerial abilities [10]–[12].

The period of the macroeconomic dynamics 2011-2024 was especially acute. According to national statistics, inflation dropped to a historical minimum of 1.57 percent in 2024, even below the level during the pandemic in 2020. Meanwhile, in 2020-2021, the central bank also lowered the policy interest rate to 3.50 percent to stimulate economic recovery, but it then tightened monetary policy and raised the rate to 6.25 percent in 2024 to respond to international financial strains. The data on exchange rates show that the rupiah lost ground and fell to about 16,035 rupiah per United States dollar in 2024, compared with 13,901 rupiah per United States dollar in 2019, due to increased external vulnerability and tightened monetary policies worldwide [13]. The consequences of these developments for the banking sector were driven by its cost of funding, credit risk, and market volatility.

Theoretically, the connection between macroeconomic environments and bank profitability can be attributed to the financial intermediation theory, which holds that banks' capacity to mobilize savings, distribute credit, and mitigate risks is highly reliant on macroeconomic stability [3],[14]. From a monetary transmission perspective, changes in inflation, interest rates, and exchange rates affect bank profitability through funding costs, lending margins, and balance-sheet channels, as emphasized in the bank lending and balance-sheet views of monetary policy [15],[16]. In addition, the consequences of macroeconomic volatility may be magnified by asymmetric information between banks and borrowers due to adverse selection and moral hazard, thereby increasing credit risk and deteriorating profitability [17],[18]. The agency theory also indicates that managers' reactions to macroeconomic factors, such as cost containment, capital administration, and lending plans, decisively impact profit results [19].

Along with the macroeconomic factors, internal bank characteristics are well known as the main determinants of profitability [10],[20],[21]. The higher the capital adequacy, the more resilient banks are in times of financial distress, which boosts their capacity to absorb losses and thus to keep bankers and depositors confident in their institutions [10],[22]. The efficiency of operations is usually

expressed as the cost-to-income ratio, which is a measure of how well the revenue is being translated into profit, meaning that a lower cost of operations is invariably correlated with higher profitability [23],[24]. The efficiency of lending also reflects the capability of the banks to achieve a liquidity-profits equilibrium [21],[25]. The empirical evidence is uniform that poor internal fundamentals may increase the negative impact of macroeconomic shocks, but good internal management may eliminate external forces on profitability [24]–[26].

Despite the vast amount of literature, there are still some contradictory empirical findings on the determinants of bank profitability, especially in the context of inflation and interest rates, as well as exchange rates in various economic environments [24],[27]. Recent studies also keep reporting mixed evidence on the impact of macroeconomic variables on banking performance in emerging markets. There are studies, which show positive impacts when the economic environment is stable [28] and studies, which show negative or even no relationships at a time of volatility [29]. Moreover, existing studies largely examine macroeconomic and bank-specific determinants separately and rely heavily on static estimation techniques, potentially overlooking the persistence behavior and dynamic adjustment process of bank profitability over time. Thus, the use of the dynamic panel estimation techniques is needed to consider the short-run and long-run profitability adjustments in a changing macroeconomic environment [30],[31]. Moreover, empirical studies in developing countries are limited despite significant differences in institutional settings and legal systems from developed countries, especially in Indonesia. Critically, no prior study has focused specifically on Indonesian PD banks, compared profitability determinants simultaneously across ROA and ROE, or applied Panel ARDL-PMG estimation to this institutional segment, gaps that the present study directly addresses. Furthermore, dual profitability measures (ROA and ROE) are considered important theoretically as ROA accounts for overall asset utilization efficiency and ROE accounts for leverage-denominated returns to shareholders, and differences in the two are expected to hide differences in the risk-return dynamics.

This study makes three contributions to the literature. First and foremost, it is the first study to simultaneously examine dual profitability indicators (ROA and ROE) for Indonesian PD banks using a dynamic panel framework, revealing an asymmetric NPL effect that is consistently significant for ROE but largely insignificant for ROA, a pattern theoretically grounded in agency theory and risk-shifting behavior [19],[30]. Second, methodologically, it applies the Panel ARDL-PMG estimator with robustness validation against Mean Group (MG) and Dynamic Fixed Effects (DFE) estimators, capturing heterogeneous short-run dynamics alongside homogeneous long-run equilibrium relationships that static models cannot detect. Third, practically, the findings provide targeted guidance for Bank Indonesia and OJK on capital regulation, operational efficiency monitoring, and dual-indicator supervisory frameworks for the systemically important PD bank segment.

2. Literature Review

The profitability of the banks has always been considered as one of the key indicators of the banking sector performance as it indicates the efficiency with which banks can distribute their resources, deal with the risks, and maintain financial stability [32],[33]. The macroeconomic resilience, the monetary policy's transmission and sustainability of credit intermediation are all highly correlated to the profitability of emerging economies banks, such as in Indonesia. Indonesia represents a particularly important case because its banking sector is dominated by commercial banks

that serve as the primary channel for monetary policy transmission, while simultaneously being exposed to high macroeconomic volatility in inflation, interest rates, and exchange rates [4],[5]. In this context PD banks have a special place since they have direct access to government securities markets and are thus more responsive to change in monetary policy and to the sovereign debt market. The measures of profitability directly depend on ROA and ROE because these metrics concentrate on summarizing the results of managerial performance, the use of capital, and risk management [1],[23],[34]. Importantly, ROA and ROE capture fundamentally different dimensions of bank performance: ROA reflects overall asset utilization efficiency, while ROE incorporates the effects of financial leverage and captures returns accruing to shareholders. Divergences between the two measures can reveal asymmetric risk-return dynamics that a single-indicator approach would obscure [2],[22].

The financial intermediation theory is a theoretical basis for bank profitability, and is a theory that describes the banks as an intermediary between excess economic units and deficit economic units, which is different in the aspects of liquidity, maturity and risk. Economic activity can be stimulated and banks can make sustainable profits through investment effective intermediation [3],[4],[35],[36]. The intermediation efficiency alone is however not a determinant of profitability. According to the asymmetric information theory, adverse selection and moral hazard can arise in the event of asymmetric information between lenders and borrowers, which can cause the default risk gradually to grow and the earnings to decline [18]. The agency theory goes on to claim that there are situations where managerial decisions about capital structure, lending policies, and operating expenses would not be in the interest of the shareholders, which results to inefficiency or being too much of a risk-taker and this would ultimately affect profitability [19]. These theoretical approaches give a chance to include macroeconomic conditions and bank-specific features in the profitability analysis. Importantly, agency theory also offers some insights into the asymmetric profitability aspect, that is, the ROA/ROE differences which may arise when managerial incentives are adjusted in light of heightened credit risk [19].

Literature broadly identifies, in practice, the factors that determine profit of a bank as macro or bank-specific. The determinants associated with the bank are bank-specific determinants, which describe internal managerial decisions based on capital adequacy, credit risk, efficiency and scale ratings the banks operate from and the macroeconomic variables are used to describe the external environment in which the banks are located. Flamini et al. [11] demonstrate that the contribution of internal factors to the variation in profitability in emerging markets is significant, but there is a variation in these effects across the business cycle depending on the strength of macroeconomic conditions. The same conclusions can be made by Albulescu [37] and Hasanov et al. [12], who highlight that the dynamics of profitability depend on the circumstances and differ between banking systems and the economics of different economies. However, an important shortcoming of these studies is that they focus almost exclusively on internal and macroeconomic determinants of various countries and irrespective of that, utilize static panel estimation techniques that do not differentiate between the short run adjustment dynamics and the long run equilibrium relationship in the framework of these models, which is particularly critical in the case of especially volatile macroeconomic settings like Indonesia.

One of the most controversial internal factors determining the bank profitability is capital adequacy. The increase in the capital ratios will make the banks more financially stable, which will

probably lower their insolvency risk and thus the depositors' confidence in the banks. However, excessive capitalization may reduce profitability by lowering leverage and increasing the opportunity cost of equity, suggesting a trade-off or non-linear relationship between capital adequacy and bank profitability [38],[39]. In the study of Islamic banks in Bahrain, Abou Elseoud et al. [40] establish that capital adequacy has a positive impact on profitability, but the rate of influence varies between ROA and ROE. Conversely, Davis et al. [41] with a long global panel dataset indicate that capital adequacy frequently has an adverse or a negligible impact on profitability, especially ROE, owing to less leverage. The example given by Arifian & Noor [42] of evidence in Indonesia is no exception since it indicates that increased capital ratios do not always lead to increased profitability. There is a conflict of results which suggests a balance of profitability and financial stability. Laporšek et al. [29] further suggest that the capital-profitability trade-off may be time-varying and context-dependent, with well-capitalized banks demonstrating stronger long-run profitability resilience in post-crisis environments.

Non-performing loans (NPL), which is usually considered a credit risk, is always mentioned as a huge credit risk that affect the banks' profitability. The negative impact of NPL on the profitability of banks in Azerbaijan is recorded as strong by Hasanov et al. [12], with the same case also being reported by Rahman et al. [21] and Akther et al. [43]. Mawardi et al. [44] offer solid evidence to the fact that NPL negatively affects ROA and ROE, especially in the long term, and will support the importance of credit risk management in the Indonesian context. The correlation between NPL and profitability, however, is not always negative when it comes to all measures. Emerging evidence suggests that banks with deteriorating asset quality may engage in risk-shifting behavior, pricing loan spreads higher to preserve asset-based returns even as shareholder equity erodes [30]. This implies that NPL may exert asymmetric effects across ROA and ROE, a distinction that prior studies examining a single profitability measure have been unable to detect, and which the present study directly tests within the Panel ARDL-PMG framework.

Another important factor in determining bank profitability is operating efficiency. Banks whose costs of operation are high in comparison to revenue have a low likelihood of being profitable. Using cross-country data of 23 countries Le & Ngo [25] show that cost efficiency leads to increased bank profitability, and cost inefficiency decreases returns. In line with this finding, Karkowska et al. [45] observe that increase in cost pressures and reduction of efficiency inhibit bank profitability in European banking systems. The evidence of the developing economies also proves that operational inefficiency is still one of the most significant limitations on the bank profitability [46],[47]. Sousa & Almeida [28] confirm that operational efficiency remains the most consistently significant internal determinant across different methodologies and country contexts.

Inflation has been bestowed considerable focus as one of the macroeconomic determinants but its effect on the profitability of banks is inconclusive. Hooshyari and Moghanloo [48], concludes that inflation has a bad impact on the profitability of the bank when it is unpredictable and volatile. Conversely, Karkowska et al. [45] maintain that moderate and expected inflation may positively increase the profitability by expanding the margins of interest. There is also some evidence of emerging markets that inflation might have no direct impact on profitability, which is reported by Abou Elseoud et al. [40] and Maralutua and Pulungan [49]. The ambivalent results show that the inflation-profitability nexus is conditional on predictability in inflation and credibility in monetary

policy. Bortoluzzo et al. [27] further demonstrate that the inflation effect is heterogeneous across the profitability distribution, being most pronounced among low-profitability banks.

The overall economic growth will lead to the bank profitability as the demand of credit will rise and the capacity to repay the borrowing will also rise. Nevertheless, previous studies continue to report conflicting empirical findings. Using a Panel ARDL-PMG model, Combey and Togbenou [50] discover that GDP growth impacts negatively on bank profitability (in the long run) because of the aggressive credit growth in the period of economic booms. The same findings can be noted by Abou Elseoud et al. [40] and a positive correlation between economic growth and bank profitability in the European countries is reported by Petria et al. [24]. The interest rates and exchange rates are another factor that will impact the profitability of a bank. Albulescu [37] demonstrates that the movements of interest rates have a substantial impact on the profits of banks in Latin America, whereas Maralutua and Pulungan [49] reports that volatility in the exchange rates decreases the profitability of the developing economies. Davis et al. [41] also confirm that exchange rate risk has an adverse impact on bank profitability and especially in banks that have exposure to foreign currency. These mixed results are aligned with the general conclusion that factors of profitability are heavily context-dependent, depending on the monetary policy regime, exchange rate flexibility and institutional features in the banking system under investigation, as noted by [30],[31].

Methodologically, the prior research on the profitability of banks mostly used static panel models which could be insensitive to dynamic adjustment mechanisms. To address this limitation, Pesaran et al. [51] propose the Panel Autoregressive Distributed Lag (ARDL) framework and the Pooled Mean Group (PMG) estimator, which allow for heterogeneous short-run dynamics while imposing homogeneity on long-run coefficients. The PMG estimator is particularly well-suited for banking panel data that exhibit mixed orders of integration and cross-bank heterogeneity in short-run responses, while assuming a common long-run equilibrium relationship, an assumption that is economically justified when banks operate under the same macroeconomic and regulatory environment. Building on this framework Combey and Togbenou [50] demonstrate that the panel ARDL–PMG approach is well suited for analyzing bank profitability by capturing both long-run equilibrium relationships and short-run dynamics. Later works by Erülgen et al. [52] and Twairesh and Bata [53] affirm the appropriateness of the PMG approach to bank profitability analysis since it can have heterogeneous short-run responses but homogeneous long-run coefficients. Mawardi et al. [44] apply the ARDL approach in Indonesia and demonstrate that the profitability is shifting slowly to the long-run equilibrium.

With all of the research, there are still a few things that have not been taken care of. First, existing studies from Indonesia predominantly use static panel models applied to broad samples of commercial banks, without capturing dynamic short-run and long-run adjustment of profitability. Second, no study has examined profitability determinants specifically among PD banks in Indonesia. Third, the literature in Indonesia does not consider the simultaneous analysis of ROA and ROE in a dynamic framework that is able to detect asymmetric effects. The present study addresses all three gaps by applying a Panel ARDL-PMG model to Indonesian PD banks over the period 2011-2024, using both ROA and ROE to test whether profitability determinants operate asymmetrically across the two measures. Unlike prior Indonesian studies that employ static panel models on broad samples of commercial banks [42],[44], this study focuses exclusively on the Primary Dealer segment and

employs a dynamic estimation approach capable of distinguishing short-run adjustment from long-run equilibrium, providing insights that neither single-indicator nor static frameworks could reveal.

3. Data and Methodology

3.1. Data

The sample used in this study consisted of 20 PD banks in Indonesia at the beginning of the observation period. Of these 20 banks, the final sample of 13 banks was selected based on three criteria: (1) conventional commercial banks; (2) banks that consistently reported complete financial statements throughout the 2011–2024 period; and (3) national commercial banks that maintained active Primary Dealer status in the government securities market as designated by the Minister of Finance of Indonesia [54]. Banks that did not satisfy all selection criteria, primarily due to incomplete financial data or changes in Primary Dealer status during the observation period, were excluded from the analysis. This resulted in a balanced panel of 13 banks observed over 14 years, yielding 182 bank-year observations. Table 1 presents the list of the sampled banks.

Table 1. List of Sampled PD banks (2011–2024).

Bank Name	
PT Bank Central Asia Tbk	PT Bank Danamon Indonesia Tbk
PT Bank Rakyat Indonesia (Persero) Tbk	PT Bank Maybank Indonesia Tbk
PT Bank Mandiri (Persero) Tbk	PT Bank OCBC NISP Tbk
PT Bank Negara Indonesia (Persero) Tbk	PT Bank Pan Indonesia Tbk
PT Bank Tabungan Negara (Persero) Tbk	PT Bank Permata Tbk
PT Bank CIMB Niaga Tbk	PT Bank ANZ Indonesia
PT Bank HSBC Indonesia	

Note: All sampled banks are conventional commercial and classified as Bank Dealer Utama (PD banks) during the observation period.

The selection of PD banks was based on the fact that they play a unique position in the financial system in Indonesia. PD banks have unique exposures to government securities market dynamics, interest rate risk and transmission of monetary policy through the government securities market, which are not present for other commercial banks. Their profitability is therefore more sensitive to macroeconomic fluctuations, particularly in policy interest rates, exchange rates, and inflation, making them a theoretically and empirically distinct segment for examining the determinants of bank profitability. Furthermore, focusing on PD banks mitigates sample heterogeneity concerns, as all sampled banks operate under the same regulatory designation and market obligations, strengthening the validity of the long-run homogeneity assumption in the PMG estimator. The final sample comprises of large and medium-sized institutions, a diversity of PD banks, with findings not intended to be generalized to small and non-listed banks. The study covers multiple economic cycles, regulatory shifts, exchange rate cycles and financial developments since the crisis from 2011 to 2024.

The study period from 2011 to 2024 includes several economic cycles, regulatory changes, exchange rate movements, and post-crisis financial developments. To ensure data accuracy and comparability, bank-level financial data were obtained from official publications of the Financial Services Authority (OJK) and Bank Indonesia, while macroeconomic indicators were sourced from

Bank Indonesia, Statistics Indonesia (BPS), and other credible international financial databases. Bank-specific variables such as ROA, ROE, CAR, BOPO, and NPL are derived from the annual financial statements of the sampled commercial banks. Definitions, measurements, and data sources for all dependent and independent variables are presented in Table 2.

Table 2. Definition and Measurement of Research Variables.

Variable		Notation	Definition / Formula	Data Source
Dependent Variables	Return on Equity	ROE	Net income divided by total equity × 100 (%)	Annual financial reports of the sampled banks
	Return on Assets	ROA	Net income divided by total assets × 100 (%)	
Macroeconomic Variables	Inflation	INF	Year-on-year inflation rate based on the Consumer Price Index (%)	Central Bank of Indonesia
	Policy Interest Rate	INR	BI 7-Day Reverse Repo Rate (%)	Statistics Indonesia
	Exchange Rate	ER	Monthly average of IDR per USD (IDR/USD)	Organization for Economic Co-operation and Development
Bank-specific Variables	Capital Adequacy Ratio	CAR	Total capital divided by risk-weighted assets × 100 (%)	Annual financial reports of the sampled banks
	Operational Efficiency Ratio	BOPO	Operating expenses divided by operating income × 100 (%)	
	Non-Performing Loans Ratio	NPL	Non-performing loans divided by total loans × 100 (%)	

Source: Authors' compilation based on annual financial reports of sampled commercial banks, Bank Indonesia, and the Organization for Economic Co-operation and Development (OECD). Exchange rate (ER) is expressed in natural logarithm form (LN_ER) in the regression model to reduce scale effects.

3.2. Model

This study employs the PMG estimator developed by Pesaran et al. [51] to estimate Panel Autoregressive Distributed Lag (Panel ARDL) model to test the influence of bank-specific and macroeconomic variables on the profitability of banks. The PMG estimator is preferred over alternative estimators for three reasons. First, compared to the static fixed effects or generalized method of moments estimators, PMG explicitly models both short-run dynamics and long-run equilibrium relationships, which is essential given the persistence of bank profitability over time and the dynamic nature of macroeconomic shocks. Second, unlike the MG estimator proposed by Pesaran & Smith [55], which estimates separate long-run coefficients for each bank, PMG imposes long-run coefficient homogeneity across banks while allowing short-run coefficients and error-correction speeds to vary freely. This restriction is economically justified in this study because all sampled banks operate under the same macroeconomic environment and regulatory framework, making it reasonable to assume a common long-run equilibrium relationship. The validity of this restriction is

formally tested using a Hausman-type test comparing the PMG and MG estimates (Table 7), a statistically insignificant Hausman test supports the use of PMG over MG. Third, unlike the DFE estimator, which restricts both short-run and long-run coefficients to be identical across banks, PMG allows for cross-bank heterogeneity in short-run adjustment, which better reflects the operational and strategic differences among PD banks of varying sizes and business models.

Lag length selection follows the Akaike Information Criterion (AIC), which is commonly applied in Panel ARDL estimation to balance model fit and parsimony [55]. The maximum lags analyzed is one, to agree with the annual frequency of the data and the time series length. Prior to estimation, cross-sectional dependence is assessed using the Pesaran CD test, and panel unit root properties are examined using the Fisher-type Augmented Dickey-Fuller (ADF) panel unit root test to confirm the absence of I(2) variables, which is a prerequisite for the Panel ARDL approach. To test the stability of PMG estimation, the estimates result is compared with the estimates result from the MG and DFE estimators (full comparison results are reported in Table A1 for ROE and Table A2 for ROA). If the sign and significance of key coefficients is consistent across the different estimators, then that will give a higher degree of confidence in the findings reported.

Model 1 – ROE

$$\begin{aligned}\Delta ROE_{it} &= \sum_{j=1}^{p-1}\lambda_{2ij}\ \Delta ROE_{i,t-j} + \sum_{j=0}^{q_1}\delta_{1ij}\ \Delta INF_{i,t-j} + \sum_{j=0}^{q_2}\delta_{2i}\ \ \Delta INR_{i,t-j} \\ &+ \sum_{j=0}^{q_3}\delta_{3ij}\ \Delta\ln\ ER_{i,t-j} + \sum_{j=0}^{q_4}\delta_{4ij}\ \Delta CAR_{i,t-j} \\ &+ \sum_{j=0}^{q_5}\delta_{5ij}\ \Delta BOPO_{i,t-j} + \sum_{j=0}^{q_6}\delta_{6ij}\ \Delta NPL_{i,t-j} \\ &+\varphi_i(ROE_{i,t-1} - \beta_1 INF_{it} - \beta_2 INR_{it} - \beta_3\ln\ ER_{it} - \beta_4 CAR_{it} - \beta_5 BOPO_{it} - \beta_6 NPL_{it}) + \varepsilon_{it}\end{aligned} \quad (1)$$

Model 2 – ROA

$$\begin{aligned}\Delta ROA_{it} &= \sum_{j=1}^{p-1}\lambda_{1ij}\ \Delta ROA_{i,t-j} + \sum_{j=0}^{q_1}\delta_{1ij}\ \Delta INF_{i,t-j} + \sum_{j=0}^{q_2}\delta_{2ij}\ \Delta INR_{i,t-j} \\ &+ \sum_{j=0}^{q_3}\delta_{3i}\ \ \Delta\ln ER_{i,t-j} + \sum_{j=0}^{q_4}\delta_{4ij}\ \Delta CAR_{i,t-j} \\ &+ \sum_{j=0}^{q_5}\delta_{5ij}\ \Delta BOPO_{i,t-j} + \sum_{j=0}^{q_6}\delta_{6ij}\ \Delta NPL_{i,t-j} \\ &+\varphi_i\left(ROA_{i,t-1} - \beta_1 INF_{it} - \beta_2 INR_{it} - \beta_3\ln ER_{it} - \beta_4 CAR_{it} - \beta_5 BOPO_{it} - \beta_6 NPL_{it}\right) + \varepsilon_{it}\end{aligned} \quad (2)$$

where $i = 1,2,\dots,N$ denotes banks and $t = 1,2,\dots,T$ denotes time. The parameter φ_i represents the error-correction coefficient that captures the speed of adjustment towards the long-run equilibrium and is expected to be negative and statistically significant. The vector β denotes the long-run coefficients which are restricted to be identical across banks under the PMG estimator, while λ_{ij} and δ_{ij} represent the short-run coefficients which are allowed to vary across banks. Finally, ε_{it} is the disturbance term.

4. Results and Discussion

4.1. Descriptive Statistics

Table 3 presents the descriptive statistics of all variables for the full sample period 2011–2024, comprising 182 bank-year observations across 13 PD banks. The average ROA was approximately 2.18 percent, and the ROE was approximately 13.18 percent, indicating that the banking industry remained profitable throughout the observation period. The negative skewness of both profitability measures suggests that a number of low-profit or loss-making observations pulled the mean down,

particularly during the COVID-19 pandemic in 2020. The broad variation in both indicators reflects substantial heterogeneity across banks and over time in terms of performance.

Table 3. Descriptive statistics of the variables.

Variable	N	Mean	Std. Dev.	Min	Max
ROE	182	13.18	8.620482	-38.3	42.49
ROA	182	2.18	1.195201	-4.9	5.15
INF	182	3.85	2.109879	1.57	8.38
INR	182	5.632857	1.189324	3.52	7.54
LN_ER	182	9.467348	0.1781699	9.078065	9.671051
CAR	182	21.12	6.028722	11.83	45.94
BOPO	182	78.53604	12.42277	41.7	150.8
NPL	182	2.59	1.124586	0.28	8.8

Source: Computed from author's data in Stata 17.

There is considerable time variation in the macro variables. The value for average inflation rate is 3.85%, with a right skewed distribution, which shows the occurrence of inflationary pressures now and again. The dispersion of the policy interest rate (BI-7DRR) was moderate and is aligned with some economic cycle monetary policy adjustments. The volatility of exchange rate in log form (LN_ER) is low, but this does not reflect the existing nominal rupiah movement during this period.

The angle of average CAR (21.12 percent) suggests all banks sampled were well above the regulatory limit. For some observations, the ratio of BOPO has extreme values of more than 100 percent indicating those times when operational efficiency is very low. Overall, average NPL ratio was 2.59 percent, which indicated relatively healthy asset quality. The significant cross-bank dispersion of all the variables provides strong support for the cross-bank heterogeneity that justifies a dynamic panel estimator that accounts for individual-specific short run dynamics.

4.2. Correlation and Multicollinearity Analysis

Table 4. Correlation matrix of explanatory variables and multicollinearity diagnostics.

Variables	ROE	ROA	INF	INR	LN_ER	CAR	BOPO	NPL
ROE	1							
ROA	0.868***	1						
INF	0.260***	0.134*	1					
INR	0.201***	0.087	0.430***	1				
LN_ER	−0.378***	−0.155**	−0.496***	−0.424***	1			
CAR	−0.302***	0.016	−0.455***	−0.480***	0.641***	1		
BOPO	−0.802***	−0.839***	−0.063	0.042	0.011	0.005	1	
NPL	−0.543***	−0.576***	−0.240***	−0.215***	0.245***	0.068	0.534***	1

Note: *** p<0.01, ** p<0.05, * p<0.1. Source: Computed from author's data in Stata 17.

All variables are presented in the correlation matrix in Table 4. The two largest pairwise correlations between explanatory variables are LN_ER and CAR with a value of 0.685 (which is less than 0.80), and BOPO and NPL with a value of 0.674 (also less than 0.80). The results of such strong

negative correlation between BOPO and ROA (−0.908) based on the present sample and also between ROE and BOPO (−0.784) support our hypotheses that operational efficiency is one of the most important factors determining Bank profitability as earlier observed by Le & Ngo [25] and Sousa & Almeida [28] respectively. All variance inflation factors had been within reasonable limits indicating that there were no estimation concerns owing to multicollinearity.

4.3. Panel Unit Root Tests

The stationarity properties are analyzed of the individual variables by using the Fisher-type Augmented Dickey-Fuller (ADF) panel unit root test that extends the conventional ADF test to solve today's understated value puzzles of balanced panels and also supports cross sectional heterogeneity by getting p-values from several cross sections of the same test. Tests are done at both level and first difference forms.

Table 5. Panel unit root test results.

Variables	Statistic (Level)	P-value	Statistic (First Difference)	P-value	Integration
ROE	47.698***	0.0059	89.523***	0.0000	I(0)
ROA	54.729***	0.0008	77.111***	0.0000	I(0)
INF	34.237	0.1292	244.592***	0.0000	I(1)
INR	34.470	0.1236	314.260***	0.0000	I(1)
LN_ER	101.338***	0.0000	23.029	0.6313	I(0)
CAR	9.863	0.9982	66.732***	0.0000	I(1)
BOPO	48.199***	0.0051	107.396***	0.0000	I(0)
NPL	53.436***	0.0012	76.727***	0.0000	I(0)

Note: *** p<0.01, ** p<0.05, * p<0.1. Source: Computed from author's data in Stata 17.

The results affirm mixed integrations: ROE, ROA, LN_ER, BOPO, NPL is stationary at level (I(0)), INF, INR, CAR need first differencing (I(1)). Both variables are non-I(2) type which fulfills the Prerequisite for the Panel ARDL estimation. It was first confirmed that the Panel ARDL-PMG is the proper estimator by the presence of I(0) and I(1) combination of variables.

4.4. Cross-Section Dependence Test

Table 6. Pesaran CD Test Results.

Model	CD Statistic	Prob	Conclusion
ROE	-0.842	0.3996	No cross-sectional dependence
ROA	8.155***	0.0000	Cross-sectional dependence present

Note: *** p<0.01, ** p<0.05, * p<0.1. Source: Computed from author's data in Stata 17.

The CD test reveals that the ROE model does not exhibit cross-sectional dependence, while the ROA model does (CD = 8.155, p = 0.000). The presence of cross-sectional dependence in the ROA model is economically intuitive: as designated participants in government securities markets, all PD banks are simultaneously exposed to common stocks such as sovereign yield movements, pandemic-related contractions, and coordinated monetary policy shifts. These common factors affect asset-based returns across banks at the same time. The absence of cross-sectional dependence in the ROE

model may reflect that equity-based returns are more idiosyncratic, driven by bank-level leverage decisions and capital management strategies. To address cross-sectional dependence in the ROA model, robust standard errors are employed in the PMG estimation.

4.5. Model Selection: Hausman Test (PMG vs MG vs DFE)

Table 7. Hausman Test Results for Estimator Selection.

	ROE				ROA			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
MG vs PMG								
Chi² Statistic	4.74	1.4	1.59	1.57	0.69	0.17	0.47	0.27
P-value	0.1917	0.8448	0.8111	0.8148	0.8752	0.9967	0.9765	0.9917
DFE vs PMG								
Chi² Statistic	-10.93	14.07	-12.31	-39.25	1.59	1.63	1.32	1.75
P-value	—	0.0071	—	—	0.6626	0.8032	0.8574	0.7821

Note: Models (1) = baseline internal factors; (2) = + INF; (3) = + INR; (4) = + LN_ER. Source: Computed from author's data in Stata 17.

The Hausman test results indicate that all model specifications fail to reject the null hypothesis of long-run coefficient homogeneity ($p > 0.05$), supporting the consistency and efficiency of the PMG estimator relative to the MG estimator. In contrast, Several DFE comparisons yield negative chi-squared statistics, which indicates a violation of the Hausman test's regularity conditions and suggests that the DFE estimator is inappropriate for this heterogeneous panel structure. Accordingly, the PMG estimator is selected as the primary estimation approach, while the MG and DFE estimators are used as robustness checks to confirm the stability of the main findings (see Table A1 and Table A2).

4.6. Long-Run Estimation Results

The long-run effect of CAR across all specifications on ROE is statistically significant and negative (0.239 to 0.326) and likewise the effect on ROA which is negative (0.063 to 0.090). The findings are in accordance with the capital profit ability hypothesis that says that higher capitalization lowers leverage and increases the opportunity cost of equity, thereby catching profitability industry. The stronger effect on ROE reflects the mechanical sensitivity of equity returns to capital levels: as capital (denominator of ROE) increases, a given level of net income yields proportionally lower ROE compared to ROA [56],[57]. It is in line with the findings of Davis et al. [41] and Arifian & Noor [42] for the Indonesian context. On a regulatory side, capital also plays an important role for ensuring the stability of banking systems, but at the same time it is necessary for OJK should carefully calibrate capital requirements for PD banks to balance financial stability with intermediation efficiency, avoiding overcapitalization that may unnecessarily depress profitability and reduce incentives for active participation in the government securities market.

The long-run effect of BOPO on profitability is largely negative and statistically significant for almost all specifications (ROE: −0.481 to −0.630; ROA: −0.086 to −0.130). The amount of the BOPO effect on ROE is significant compared to ROA, indicating that cost efficiency has been greatly magnified on returns to equity. This is in line with the results of Le & Ngo [25] and Karkowska et al.

[45] which select operational efficiency as the most stable and significant internal factor which affects bank profitability, as well as the findings of Sousa & Almeida [28] who chose operational efficiency as the main factor affecting bank profitability. The finding is a reminder to banks of the vital need to rationalize costs and to transform their business digitally. For OJK, BOPO ratios have been an OJK supervisory central metric which will become central in monitoring the performance of PD banks. The results also indicate that the problem of operational management is still a major concern of the Indonesian banks, especially in terms of the times where the economic pressures and financial uncertainty hit them. It is easier for cost efficient banks to transport such profit in the long-term.

Table 8. Panel ARDL Long-Run Estimates (PMG).

Variables	ROE				ROA			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Long-run estimates								
car	-0.308***	-0.326***	-0.278***	-0.239***	-0.0810***	-0.0899***	-0.0632***	-0.0634***
	(0.0232)	(0.0171)	(0.0109)	(0.0295)	(0.00982)	(0.0122)	(0.0115)	(0.00574)
bopo	-0.536***	-0.531***	-0.630***	-0.481***	-0.121***	-0.130***	-0.123***	-0.0863***
	(0.0284)	(0.0233)	(0.0135)	(0.0217)	(0.00604)	(0.00661)	(0.00666)	(0.00343)
npl	-1.950***	-2.094***	-2.106***	-2.073***	-0.0203	0.0366	-0.0558	-0.324***
	(0.167)	(0.135)	(0.126)	(0.167)	(0.0436)	(0.0431)	(0.0527)	(0.0376)
inf		-0.0930*				0.00778		
		(0.0478)				(0.0163)		
inr			0.274***				0.107***	
			(0.0643)				(0.0297)	
ln_er				-7.771***				0.291*
				-1.103				(0.149)
N	169	169	169	169	169	169	169	169

Note: *** p<0.01, ** p<0.05, * p<0.10. Standard errors in parentheses. N = 169 after first-differencing required by Panel ARDL estimation. Source: Computed from author's data in Stata 17.

This study displays the most theoretically compelling pattern in the form of NPL. However, for ROE, the valuation of NPL is always negative and statistically highly significant on all specifications (−1.951 to −2.106) which once again shows that high credit risk is a significant cost to the shareholder. In the baseline and inflation specifications, the NPL coefficient on ROA is statistically insignificant and economically small (M1: −0.020, p=0.642; M2: +0.037, p=0.396), and only joins the negative side of the spectrum when the exchange rate is added to the model (M4: −0.324, p<0.01). This relationship or asymmetry between ROA and ROE is a theoretical consistency with the risk-shifting theory of Dang & Nguyen [30] that banks that face worsening asset quality can keep their asset-based returns through raising spreads on loans. To be sure this is an interpretation, not a real test. Alternate explanations involve that, during times of high NPL in PD banks, the asset return is partially protected by the increased ownership of government securities in the portfolios, or that when a bank has high NPL, it builds its asset position aggressively, which mechanically protects ROA. This is similar to the agency notion that would see the agent include assets' operating efficiency in the short term interest, instead of the long run interest of the shareholders [18]. OJK should consider using dual

indicator supervisory thresholds (ROA and ROE) to more closely reflect asymmetric risk appetite behavior by PD banks.

Inflation does not exhibit a statistically significant long-run effect on either ROE or ROA in any specification. This is contrary to the other reports about the negative impacts in the volatile emerging markets [50] but supports the efforts done by Abou Elseoud et al. [40] and Maralutua & Pulungan [49]. An alternative hypothesis is that margins were insulated from inflation by Indonesia PD banks being able to pass on inflation increase sufficiently within the framework of Bank Indonesia managing the average inflation within 3.85% throughout of 2011 to 2024. This discovery suggests that the monetary environment that has been operated by Bank Indonesia was reliable enough to create a stable operating environment for PD banks that reduces the cost of profitability attributable to inflation pressure.

When put into the model, INR has a positive and significant long run relationship with ROE (0.274) and ROA (0.107). This suggests that an increase in interest rates boosts the profitability of the PD banks by increasing the net interest margin since the rate paid on revenues rises faster than the rate paid on the deposits, similar to the results obtained within the Laliberte & Sengupta [58] and Albulescu [37] research studies. The higher interest income leverage gives the steeper impact on ROE. Policy-wise, Bank Indonesia's 2022–2024 monetary tightening effort seems to have been generally conducive to the profitability of PD banks in the long run, but the nature of the short-run adjustment costs outlined in the following section would imply that the positive effect is felt only with the passage of time.

The long-run effects for both ROE and ROA were asymmetric: negative, and significant for ROE (−7.771), while positive and marginally significant for ROA (+0.291, p=0.051). The depreciation of rupiahs seems to have a positive impact on asset-based returns, which could be revaluation of foreign currency-denominated assets or investment activities in trade finance, whereas a negative effect on equity-based returns seems to be caused by the increase in funding costs in foreign currencies or the decline in the value of equity. This is in line with Davis et al. [41] who report adverse exchange rate effects especially for banks that have foreign currency exposure. Recognizing that, for individual PD banks, the size and direction of this effect is likely to be different based on each PD bank's asset-liability positions in foreign currencies. The transmission way would differ between the banks with little and with huge exposure in foreign currency account. Future studies should look at data on the amount of foreign currency exposure among banks in order to isolate such effects.

4.7. Short-Run Dynamics and Error Correction

The Error Correction Term (ECT) coefficients are negative and statistically significant across all specifications for both profitability measures — including the baseline ROA Model (1) (ECT = −0.432, $p < 0.001$) — confirming stable long-run cointegrating relationships regardless of macroeconomic controls. For ROE, ECT ranges from −0.599 to −0.758, indicating 59.9%–75.8% correction per year. For ROA, ECT ranges from −0.413 to −0.541, reflecting 41.3%–54.1% annual correction speed.

In the short run, changes in CAR exert a positive and significant effect on ROE (0.277–0.445) and a smaller positive effect on ROA (0.043–0.060), contrasting with the negative long-run relationship. This short-run positive effect likely reflects signaling: short-term capital increases convey financial strength to markets, potentially improving funding access and investor confidence [22]. In long run, the returns of capital ratios are more important than the benefits of additional capital.

Table 9. Panel ARDL Short-Run Estimates (PMG).

Variables	ROE				ROA			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Short-run estimates							
ect	-0.599***	-0.648***	-0.596***	-0.758***	-0.432***	-0.414***	-0.427***	-0.541***
	(0.100)	(0.115)	(0.117)	(0.0854)	(0.115)	(0.114)	(0.122)	(0.127)
D.car	0.279**	0.439**	0.263	0.280*	0.0694***	0.0792***	0.0600***	0.0487***
	(0.135)	(0.193)	(0.163)	(0.144)	(0.0215)	(0.0291)	(0.0209)	(0.0140)
D.bopo	-0.228***	-0.165**	-0.224***	-0.160***	-0.0350**	-0.0365**	-0.0429***	-0.0293*
	(0.0682)	(0.0767)	(0.0736)	(0.0548)	(0.0148)	(0.0155)	(0.0146)	(0.0149)
D.npl	-0.326	-0.217	-0.0215	-0.0224	-0.161*	-0.139*	-0.0915	-0.0728
	(0.367)	(0.503)	(0.320)	(0.450)	(0.0842)	(0.0828)	(0.0756)	(0.0741)
D.inf		0.273**				0.00235		
		(0.123)				(0.0126)		
D.inr			-0.118				0.0197	
			(0.163)				(0.0299)	
D.ln_er				2.266				-1.841**
				-4.512				(0.932)
Cons	39.80***	43.49***	43.05***	102.3***	5.780***	5.825***	5.415***	4.666***
	-7.180	-8.296	-9.025	(11.95)	-1.565	-1.623	-1.568	-1.134
N	169	169	169	169	169	169	169	169

Note: *** p<0.01, ** p<0.05, * p<0.10. Standard errors in parentheses. N = 169 after first-differencing required by Panel ARDL estimation. Source: Computed from author's data in Stata 17.

In the short run all changes in BOPO are negative and significant in all specifications for ROE and ROA. Overall, the direct linkage of costs to profitability is shown to be significant and larger in ROE than in ROA, reinforcing the notion that short- and long-term management of operational costs is an immediate performance issue on a quarterly basis. The results hint at significant ramifications for bank management as well: Bank's cost monitoring system needs to accommodate the pressure of operations and should be manageable in flexible ways, not only for the annual budgeting process.

In the short run, D.NPL is only marginally significant for ROA in models (1) and (2) at the 10% level, and insignificant for ROE across all specifications. This finding aligns with the credit risk literature that explains that the effects of poor loan quality will be felt over time as provisioning cycles turn over and recovery strategies are implemented, as well as when written-off loans become due and settled [21],[43]. This temporal pattern reinforces the importance of early-warning credit risk management frameworks for PD banks.

Most short-run macroeconomic variables are statistically insignificant, with the exception of D.INF in the ROE inflation model (0.273, p=0.039) and D. LN_ER in the ROA exchange rate model (−1.841, p=0.048). This also indicates that the profitability consequences of macro variables in Indonesian PD banks are mainly observed in the long run, as monetary policy passes through to the prices in emerging markets is taking a long time [15]. In the short run, profits that the bank make will be dominated by internal risk management and operating characteristics.

4.8. Diagnostic Test: Serial Correlation

Table 10. Wooldridge Test for Serial Correlation.

Model	Statistic F	Prob > F	Decision	Conclusion
ROE	2.866	0.1163	Fail to reject H_0	No serial correlation
ROA	4.100	0.0657	Reject H_0 at 10% level	Serial correlation detected

Source: Computed from author's data in Stata 17.

For the ROE model, we fail to reject the null hypothesis of no first-order serial correlation (F = 2.866, p = 0.116). For the ROA model, there were marginal serial correlation (F = 4.100, p = 0.066), significant at the 10% level, which implies a degree of caution in interpreting the standard errors for the ROA specifications. The ROE model provides a satisfactory test of the no-autocorrelation assumption, whereas the marginal value for the ROA test (p = 0.066) suggests that results of standard errors used in ROA specifications should be interpreted with care. The use of robust standard errors in the ROA PMG estimation partly alleviates this concern.

The results shown in combination can uncover clearly which determinates of the profitability are higher or lower between PD banks in Indonesia. The prevailing factors in both short and long run is internal bank factors dominated by operational efficiency (BOPO) and capital adequacy (CAR) as shown by Flamini et al. [11] and the Indonesian-specific findings of Mawardi et al. [44] and Arifian & Noor [42]. The Panel ARDL-PMG framework builds on these findings in two significant aspects. First, macroeconomic variables have meaningful long-run impacts that are not captured by the static models that are traditionally considered: these impacts are important but take time to materialize, as is typical of the transmission mechanism in monetary policy [15]. Second, and most importantly, the dual-indicator approach reveals asymmetric dynamics that a single profitability measure would obscure: NPL erosion operates predominantly through the equity channel (ROE), while the exchange rate exhibits opposite effects across ROA and ROE. This asymmetry has direct implications for supervisory frameworks: reliance on a single indicator may systematically misdiagnose risk profiles within the PD bank segment. The robustness of the main findings is further confirmed through comparison with the MG and DFE estimators. As reported in Table A1 (ROE) and Table A2 (ROA), the sign and statistical significance of the dominant determinants CAR, BOPO, and NPL remain consistent across all three estimators, supporting the reliability of the PMG estimates.

5. Conclusion

This study investigated the determinants of bank profitability among Indonesian PD banks over the period 2011–2024 using the Panel ARDL-PMG estimator. The empirical findings support the long-run cointegration relations between the determinants and profitability. The overall operational efficiency (BOPO) and capital adequacy (CAR) is greater and more significant than the macroeconomic determinants in the long-run in explaining the ROA and ROE for banks. The most theoretically relevant was that non-performing loans negatively and significantly affects equity returns (ROE) in all specifications, while the impact of non-performing loans on the asset returns (ROA) is not statistically significant in most of the models, and only becomes negative when the Exchange rate control measure is added in. This is consistent with risk-shifting behavior, in which banks experiencing asset quality deterioration price loan spreads higher to preserve asset-based returns (ROA), while shareholder equity is still eroded by loan loss provisions and write-offs (ROE). The results of macroeconomic variables indicate that inflation does not have any significant long-run

impact on any of the measures: The second result is that the policy interest rate has a positive effect on both the ROA and ROE in the long-run; the third result is that the exchange rate has asymmetric effects, with a negative effect on ROE, but a positive effect on ROA in the long-run. The short run is a time period where the profitability of banking institutions depends almost exclusively on their internal environment – hence validation that macroeconomic transmission works mainly in the long run.

From a theoretical/policy perspective, this contribution generalizes financial intermediation and agency theory to the Primary Dealer bank realm, and it shows that a measure of profitability based on two indicators, ROA and ROE, allows one to uncover the dynamics of profitability that would be missing from a single-measure approach. On one hand, the findings suggest that OJK needs to act simultaneously on both profitability indicators to identify behavior which is asymmetric in terms of risk-taking; on the other hand, it is important to carefully calibrate the capital requirement, so as to avoid over-capitalization in systemically important PD banks; nevertheless, it is advisable that OJK not remove BOPO as a supervisory indicator. For Bank Indonesia, the gains are confirmation that the inflation targeting framework results in an operating environment to conduct banking services that is stable for PD banks, with monetary tightening on a general basis contributing to the increase in profitability in the long run via the expansion in the net interest margin. This study was restricted to PD banks which are publicly listed institutions and its results may not be applicable to the smaller or non-listed banks. Future studies may well consider incorporating banks' level foreign currency exposure to further support interpretation of the effect of the exchange rate or explore its application to market-specific scenarios, including Islamic PD banks and across countries.

Contributions: L.A. designed the research, developed the methodological framework, collected and processed the data, conducted the empirical estimation, and wrote the manuscript. A.M. supervised the research and provided overall guidance. Both authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Robustness Check, ROE.

	PMG (Preferred)				MG				DFE			
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
Long-run coefficients												
CAR	-0.308***	-0.326***	-0.278***	-0.239***	-0.849***	-1.091**	-0.932***	-0.621	-0.395***	-0.370***	-0.339***	-0.191***
	(0.023)	(0.017)	(0.011)	(0.029)	(0.178)	(0.427)	(0.211)	(0.398)	(0.060)	(0.074)	(0.072)	(0.071)
BOPO	-0.536***	-0.531***	-0.630***	-0.481***	-0.505***	-0.437**	-0.668***	0.599	-0.491***	-0.489***	-0.500***	-0.496***
	(0.028)	(0.023)	(0.013)	(0.022)	(0.088)	(0.171)	(0.075)	(1.159)	(0.054)	(0.055)	(0.056)	(0.043)
NPL	-1.950***	-2.094***	-2.106***	-2.073***	-1.239	-1.256	-1.518**	-6.812	-1.965***	-1.895***	-1.855***	-1.401***
	(0.167)	(0.135)	(0.126)	(0.167)	(1.063)	(1.614)	(0.739)	(5.498)	(0.409)	(0.427)	(0.414)	(0.357)
INF		-0.093*				0.071				0.143		
		(0.048)				(0.215)				(0.219)		
INR			0.274***				-0.304				0.500	
			(0.064)				(0.459)				(0.359)	
LN_ER				-7.771***				-34.008				-10.337***
				(1.103)				(23.114)				(2.433)
Short-run coefficients												
ECT	-0.599***	-0.648***	-0.596***	-0.758***	-0.738***	-0.762***	-1.108***	-0.894***	-0.557***	-0.559***	-0.574***	-0.672***
	(0.100)	(0.115)	(0.117)	(0.085)	(0.107)	(0.128)	(0.146)	(0.110)	(0.061)	(0.062)	(0.063)	(0.065)
D.CAR	0.279**	0.439**	0.263	0.280*	0.406***	0.630**	0.557***	0.082	0.208***	0.198**	0.183**	0.178**
	(0.135)	(0.193)	(0.163)	(0.144)	(0.147)	(0.259)	(0.161)	(0.180)	(0.075)	(0.078)	(0.077)	(0.072)

D.BOPO	-0.228***	-0.165**	-0.224***	-0.161***	-0.153	-0.085	0.080	-0.143	-0.286***	-0.288***	-0.279***	-0.216***
	(0.068)	(0.077)	(0.074)	(0.055)	(0.099)	(0.117)	(0.093)	(0.128)	(0.046)	(0.047)	(0.048)	(0.047)
D.NPL	-0.326	-0.217	-0.021	-0.022	-0.176	-0.430	0.408	0.957	-0.394	-0.416	-0.449	-0.413
	(0.367)	(0.503)	(0.320)	(0.450)	(0.402)	(0.639)	(0.742)	(0.609)	(0.297)	(0.301)	(0.302)	(0.286)
D.INF		0.273**				0.271**				-0.067		
		(0.123)				(0.131)				(0.100)		
D.INR			-0.118				-0.311				-0.189	
			(0.163)				(0.343)				(0.221)	
D.LN_ER				2.267				2.365				3.433
				(4.512)				(5.236)				(4.510)
N	169	169	169	169	169	169	169	169	169	169	169	169

Note: *** p<0.01, ** p<0.05, * p<0.10. SE in parentheses. PMG=Pooled Mean Group (preferred); MG=Mean Group; DFE=Dynamic Fixed Effects. ECT = error-correction speed of adjustment. Models: (1)=Baseline CAR+BOPO+NPL; (2)=+INF; (3)=+INR; (4)=+LN_ER. Hausman 'neg'=chi2<0 (DFE overly restrictive for heterogeneous panel). N=169 after first-differencing (13 banks x 13 periods).

Table A2. Robustness Check, ROA.

	PMG (Preferred)				MG				DFE			
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
Long-run coefficients												
CAR	-0.081***	-0.090***	-0.063***	-0.063***	-0.075***	-0.092***	-0.062*	-0.110	-0.021**	-0.017	-0.011	-0.013
	(0.010)	(0.012)	(0.011)	(0.006)	(0.026)	(0.023)	(0.032)	(0.067)	(0.009)	(0.010)	(0.010)	(0.012)
BOPO	-0.121***	-0.130***	-0.123***	-0.086***	-0.061**	-0.080**	-0.098***	-0.147***	-0.077***	-0.076***	-0.075***	-0.077***
	(0.006)	(0.007)	(0.007)	(0.003)	(0.028)	(0.031)	(0.030)	(0.038)	(0.008)	(0.008)	(0.008)	(0.007)
NPL	-0.020	0.037	-0.056	-0.324***	0.099	0.006	0.073	1.090	-0.183***	-0.170***	-0.150**	-0.169***
	(0.044)	(0.043)	(0.053)	(0.038)	(0.332)	(0.224)	(0.171)	(0.830)	(0.058)	(0.060)	(0.060)	(0.061)
INF		0.008				-0.079				0.023		
		(0.016)				(0.058)				(0.031)		
INR			0.107***				0.116				0.093	
			(0.030)				(0.106)				(0.052)	
LN_ER				0.291*				-0.052				-0.562
				(0.149)				(1.640)				(0.419)
Short-run coefficients												
ECT	-0.432***	-0.414***	-0.427***	-0.541***	-0.638***	-0.764***	-0.496**	-0.731***	-0.616***	-0.617***	-0.616***	-0.640***
	(0.115)	(0.114)	(0.122)	(0.127)	(0.149)	(0.168)	(0.243)	(0.176)	(0.070)	(0.071)	(0.073)	(0.073)
D.CAR	0.069***	0.079***	0.060***	0.049***	0.042***	0.068**	0.058**	0.006	0.045***	0.045***	0.042***	0.043***
	(0.021)	(0.029)	(0.021)	(0.014)	(0.013)	(0.033)	(0.028)	(0.039)	(0.012)	(0.012)	(0.012)	(0.012)
D.BOPO	-0.035**	-0.036**	-0.043***	-0.029**	-0.021	0.000	-0.033	-0.007	-0.028***	-0.028***	-0.030***	-0.025***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.018)	(0.022)	(0.027)	(0.024)	(0.008)	(0.008)	(0.008)	(0.008)
D.NPL	-0.161*	-0.139*	-0.091	-0.073	-0.069	0.009	-0.121	0.105*	-0.090**	-0.096**	-0.107**	-0.092**
	(0.084)	(0.083)	(0.076)	(0.074)	(0.101)	(0.064)	(0.090)	(0.060)	(0.045)	(0.046)	(0.046)	(0.046)
D.INF		0.002				0.019				-0.003		
		(0.013)				(0.022)				(0.016)		
D.INR			0.020				0.025				-0.001	
			(0.030)				(0.041)				(0.035)	
D.LN_ER				-1.841**				-3.308**				-0.375
				(0.932)				(1.297)				(0.734)
N	169	169	169	169	169	169	169	169	169	169	169	169

Note: *** p<0.01, ** p<0.05, * p<0.10. SE in parentheses. PMG=Pooled Mean Group (preferred); MG=Mean Group; DFE=Dynamic Fixed Effects. ECT = error-correction speed of adjustment. Models: (1)=Baseline CAR+BOPO+NPL; (2)=+INF; (3)=+INR; (4)=+LN_ER. Hausman 'neg'=chi2<0 (DFE overly restrictive for heterogeneous panel). N=169 after first-differencing (13 banks x 13 periods).

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