

Capital Structure, Profitability, and Firm Value in Indonesian State-Owned Banks: Panel-Data Evidence 2021–2025

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Abstract: Firm value is an important indicator of investor confidence, yet accounting performance and market valuation do not always move together in Indonesian state-owned banks. This study examines the associations of the Debt-to-Equity Ratio (DER) and Return on Assets (ROA) with Price-to-Book Value (PBV) in four state-owned banks listed on the Indonesia Stock Exchange during 2021–2025. A balanced panel of 40 bank-semester observations was estimated using a bank fixed-effects model. The reported conventional estimates indicate positive associations of DER and ROA with PBV. The adjusted R^2 is 0.8468, but it includes the bank fixed effects and should not be attributed to the two financial ratios alone. Because the panel contains only four banks and the available output does not provide panel-robust standard errors, the inferential results are interpreted cautiously as associational evidence. The findings underline the need to interpret bank liabilities as part of the intermediation model and to assess profitability together with bank-specific risk and capitalization indicators.

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INTRODUCTION

The banking industry plays a strategic role in economic stability and national development through financial intermediation. Banks mobilize public deposits and allocate funds to credit and investment, while the Financial Services Authority (Otoritas Jasa Keuangan/OJK) supervises prudential soundness and public confidence. OJK's fourth-quarter 2023 surveillance report documented continued banking intermediation and sector resilience amid global uncertainty (Otoritas Jasa Keuangan, 2024). Strong sector performance, however, does not imply uniform market valuation across listed banks.

Firm value reflects the market's assessment of current performance and prospects. Price-to-Book Value (PBV) is especially relevant for banks because their book equity and regulated capital base are central to loss absorption and the intermediation franchise. Bank PBV therefore captures the premium or discount investors place on reported equity, expected profitability, asset quality, and franchise value (Bogdanova et al., 2018; García Martínez et al., 2024).

This study focuses on two observable correlates of PBV: funding structure and profitability. DER records total liabilities relative to equity, whereas ROA records annualized net income after tax relative to total assets. In deposit-taking institutions, liabilities include deposits and other operating funding that support earning assets; DER therefore cannot be interpreted as ordinary corporate borrowing alone. ROA, by contrast,



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summarizes the earnings generated from the asset base. Both may convey information relevant to valuation, but the observational design identifies associations rather than causal effects.

Indonesian state-owned banks provide a bounded setting in which ownership is similar, but valuation paths remain heterogeneous. In the study dataset, Bank Rakyat Indonesia's PBV peaked at 2.89 times in Semester II 2023 and declined to 1.68 times by Semester II 2025, while Bank Tabungan Negara moved from 0.33 times in Semester I 2021 to slightly above one from 2022 onward. Across all 40 bank-semester observations, PBV ranged from 0.33 to 2.89 times and ROA from 0.42% to 4.03% (Bursa Efek Indonesia, 2025; authors' calculations, 2026). These figures document substantial cross-bank and intertemporal variation; they do not, by themselves, establish a causal valuation mechanism.

The documented variation motivates an examination of whether DER and ROA are separately associated with PBV after controlling for time-invariant bank characteristics. The model does not estimate an interaction term, investor beliefs, or a causal pathway. Its purpose is narrower: to estimate contemporaneous within-bank associations in a balanced semiannual panel.

Bank-specific evidence indicates that valuation depends on more than a single financial ratio. Muhammad (2022), in an *Almana* study of Indonesian listed banks, reported a positive relationship between ROA and PBV. Wiadnyani and Artini (2023) found that ROA and operating and risk indicators were associated with the value of Indonesian banking firms, while Ika et al. (2023) reported that ROE, CAR, and LDR were related to bank PBV. International bank-valuation evidence likewise links price-to-book ratios to profitability, asset quality, costs, and franchise characteristics (Bogdanova et al., 2018; García Martínez et al., 2024). The mixed specifications and samples caution against transferring evidence from nonfinancial firms directly to deposit-taking banks.

Two narrower gaps remain. First, recent evidence centered on the four listed Indonesian state-owned banks during the 2021–2025 post-pandemic period is limited. Second, prior Indonesian studies typically combine broader banking samples or different valuation determinants and periods (Ika et al., 2023; Muhammad, 2022; Wiadnyani & Artini, 2023). This study adds a complete census of the defined state-owned bank population, semiannual observations, and bank fixed effects. Its contribution is contextual and empirical rather than a new causal theory.

This study therefore examines the separate associations of DER and ROA with PBV in all state-owned banks listed on the Indonesia Stock Exchange during 2021–2025. It asks whether within-bank changes in each ratio are associated with contemporaneous changes in PBV after absorbing time-invariant bank characteristics. The study does not estimate a DER×ROA interaction and does not claim that changing either ratio causes valuation to change.

LITERATURE REVIEW

Financial Management and Firm Value

For banks, market valuation reflects expected earnings, loss-absorption capacity, asset quality, and the value of lending and deposit relationships. PBV is informative because a bank's book equity is both an accounting residual and a prudential buffer. Ratios above one can indicate that the market assigns a premium to expected profitability and franchise value, whereas ratios below one can reflect concerns about future returns or unrecognized asset losses (Bogdanova et al., 2018; García Martínez et al., 2024).

Signaling theory provides a limited interpretive lens: published financial ratios can reduce information asymmetry by summarizing observable performance, but they do not reveal investor beliefs directly (Connelly et al., 2011). Accordingly, this study treats DER and ROA as public financial indicators associated with valuation rather than as proven signals that cause market reactions.

Capital Structure (Debt-to-Equity Ratio)

DER is defined here as total liabilities divided by total equity. In nonfinancial firms, it is often interpreted primarily as debt dependence. In banks, however, deposits and other funding liabilities are inputs to intermediation and coexist with binding capital and liquidity requirements. A higher bank DER can therefore reflect a larger funding base, lower equity capitalization, or both; its valuation meaning depends on asset quality, profitability, liquidity, and regulatory capital (Bogdanova et al., 2018; Ika et al., 2023).

This banking-specific meaning is a central boundary of the analysis. DER is retained for comparability with the stated research question, but it is not a substitute for the Capital Adequacy Ratio (CAR), regulatory leverage ratio, or equity-to-assets ratio. A robustness analysis using those prudential measures would be preferable once the underlying panel data are available; the absence of that analysis limits conclusions about bank capitalization.

Profitability (Return on Assets)

ROA measures earnings generated from the asset base and is widely used in banking research because assets consist predominantly of loans and financial instruments. Higher ROA can be consistent with efficient asset use and stronger internal capital generation, although its valuation association may also depend on risk, capitalization, and macroeconomic conditions (Wiadnyani & Artini, 2023; Yuan et al., 2022).

Previous Studies

Recent bank-specific studies provide the closest benchmark. Muhammad (2022) reported a positive association between ROA and PBV for Indonesian listed banks. Wiadnyani and Artini (2023) found that ROA was positively related to banking-firm value while NPL, BOPO, and LDR captured additional risk and efficiency dimensions. Ika et al. (2023) likewise showed that profitability, capital adequacy, and liquidity measures were relevant to Indonesian bank PBV.

Results from nonfinancial samples remain mixed: Dzulhijar et al. (2021) reported a negative DER association and an insignificant ROA association, while Purnomo et al. (2024) reported positive relationships. These comparisons illustrate industry sensitivity but are not treated as direct banking benchmarks. International bank research emphasizes that PBV is jointly shaped by profitability, asset quality, operating costs, capital, and franchise characteristics (Bogdanova et al., 2018; García Martínez et al., 2024).

The closer banking evidence suggests two expectations: PBV should be positively associated with profitability, while the sign of DER is less certain because bank liabilities combine operating funding and leverage. The present hypotheses retain the positive DER expectation stated in the original study but interpret any coefficient only within the observed DER range and institutional setting.

Association Between Debt-to-Equity Ratio and Firm Value

A positive DER association is plausible when a larger funding base supports earning assets without eroding asset quality, liquidity, or regulatory capital. A negative association is also plausible when higher liabilities indicate weaker capitalization or greater risk. Because the model does not observe those mechanisms, H1 is a directional empirical expectation rather than a causal claim.

H1: Debt-to-Equity Ratio (DER) is positively associated with Price-to-Book Value (PBV).

Association Between Return on Assets and Firm Value

Higher ROA indicates more earnings per unit of assets and may therefore be associated with a higher market premium over book equity. Indonesian bank studies report positive valuation relationships for profitability measures, although the magnitude varies with controls and sample design (Ika et al., 2023; Muhammad, 2022; Wiadnyani & Artini, 2023).

H2: Return on Assets (ROA) is positively associated with Price-to-Book Value (PBV).

Conceptual Framework

The conceptual framework treats PBV as the contemporaneous outcome, with DER and ROA as separate time-varying correlates and bank fixed effects as controls for persistent heterogeneity. No DER×ROA interaction, mediation pathway, or causal mechanism is estimated.

METHODS

This study employed an observational, explanatory panel-data design. The defined population consisted of the four state-owned commercial banks listed on the Indonesia Stock Exchange throughout 2021–2025: Bank Mandiri (BMRI), Bank Rakyat Indonesia (BBRI), Bank Negara Indonesia (BBNI), and Bank Tabungan Negara (BBTN). The unit of analysis was the bank-semester, producing 40 observations (4 banks × 10 semesters). A census was used rather than purposive sampling because every bank in the defined population was included. Eligibility required continuous IDX listing during the observation window, complete June and December financial reports, and complete DER, ROA, price, equity, and shares-outstanding data. No eligible listed state-owned bank was excluded.

Financial-statement data were obtained primarily from IDX filings and the investor-relations repositories of BMRI, BBRI, BBNI, and BBTN (Bank Mandiri, 2025; Bank Negara Indonesia, 2025; Bank Rakyat Indonesia, 2025; Bank Tabungan Negara, 2025; Bursa Efek Indonesia, 2025). The stock price was the closing price on the final trading day of June or December; if that date was not a trading day, the immediately preceding trading day was used. Yahoo Finance, Investing.com, and RTI Business were used only as cross-checks. When sources differed, the IDX/issuer record took precedence. Price, equity, and shares outstanding were placed on the same point-in-time basis; stock splits, rights issues, and other share-count changes were handled by matching the semester-end price with the shares outstanding at that same date.

DER was calculated as total liabilities divided by total equity. ROA was stored in percentage-point form and calculated as annualized net income after tax divided by closing total assets × 100; June cumulative six-month income was annualized by multiplying by two, whereas December used full-year income without further scaling. Book value per share equaled equity attributable to owners divided by semester-end shares outstanding, and PBV equaled the semester-end closing price divided by book value per share. The calculations were compiled in a spreadsheet and then transferred to EViews 12.

Table 1. Model Specification and Operational Definitions

Variable	Formula/definition	Unit	Semester timing	Expected sign
PBV_it	$P_{it} / BVPS_{it}; BVPS_{it} = E_{it} / S_{it}$	times	P: final trading day of June/December; E and S: same reporting date	Dependent variable
DER_it	Total liabilities_it / total equity_it	times	June and December statement-of-financial-position balances	+ (H1)
ROA_it	Annualized net income after tax_it / total assets_it × 100	% points	June: six-month income ×2; December: full-year income	+ (H2)

Note: i indexes banks and t indexes the ten semesters. E denotes equity attributable to owners, and S denotes shares outstanding. Prices and share counts were placed on the same corporate-action basis. ROA was stored in percentage-point form (e.g., 2.28, not 0.0228).

Source: Processed data (2026)

The analysis comprised descriptive statistics, pooled/common-effects, bank fixed-effects, and random-effects estimations. Model selection followed a stated sequence: the Chow test first compared pooled and bank fixed-effects models; the Hausman test then compared fixed and random effects; the Breusch–Pagan Lagrange Multiplier test served only as the pooled-versus-random-effects comparison. Coefficients were interpreted as conditional associations at $\alpha = 0.05$.

The archived output reports Jarque–Bera residual normality, centered VIF, White heteroskedasticity, and Breusch–Godfrey serial-correlation diagnostics. These conventional tests are reported as screening evidence only; they do not replace panel-appropriate inference for heteroskedasticity, within-bank correlation, or cross-sectional dependence. The reported coefficient table uses conventional, non-robust standard errors. With only four bank clusters, ordinary cluster-robust asymptotics are unreliable (Cameron & Miller, 2015). Therefore, the p-values are treated as provisional, and no joint DER–ROA hypothesis is tested. A definitive revision requires the underlying panel to estimate small-sample-appropriate robust inference, time-effects sensitivity, cross-sectional-dependence diagnostics, within R^2 , and prudential-capital robustness measures.

RESULTS AND DISCUSSION

This section reports the descriptive statistics, panel-model selection, and archived fixed-effects estimates for 40 observations from four banks over ten semesters. Because the available output contains conventional rather than panel-robust standard errors, statistical significance is described as provisional, and the substantive interpretation emphasizes coefficient direction, scale, and uncertainty.

Table 2. Descriptive Statistics

Variable	Mean	Median	Minimum	Maximum	Std. dev.	N
Price-to-Book Value (PBV, times)	1.420500	1.165000	0.330000	2.890000	0.629770	40
Debt-to-Equity Ratio (DER, times)	6.352750	6.525000	4.750000	7.880000	0.877423	40
Return on Assets (ROA, %)	2.280500	2.485000	0.420000	4.030000	1.019079	40

Source: Authors' calculations based on EViews 12 output (2026)

Table 2 summarizes the distribution of the variables. PBV averages 1.4205 times and ranges from 0.33 to 2.89 times. DER averages 6.3528 times and has a narrower pooled dispersion. ROA is stored in percentage points, averages 2.2805%, and ranges from 0.42% to 4.03%. These pooled statistics combine within-bank changes and persistent between-bank differences; the trend figure is therefore used to show heterogeneity explicitly.

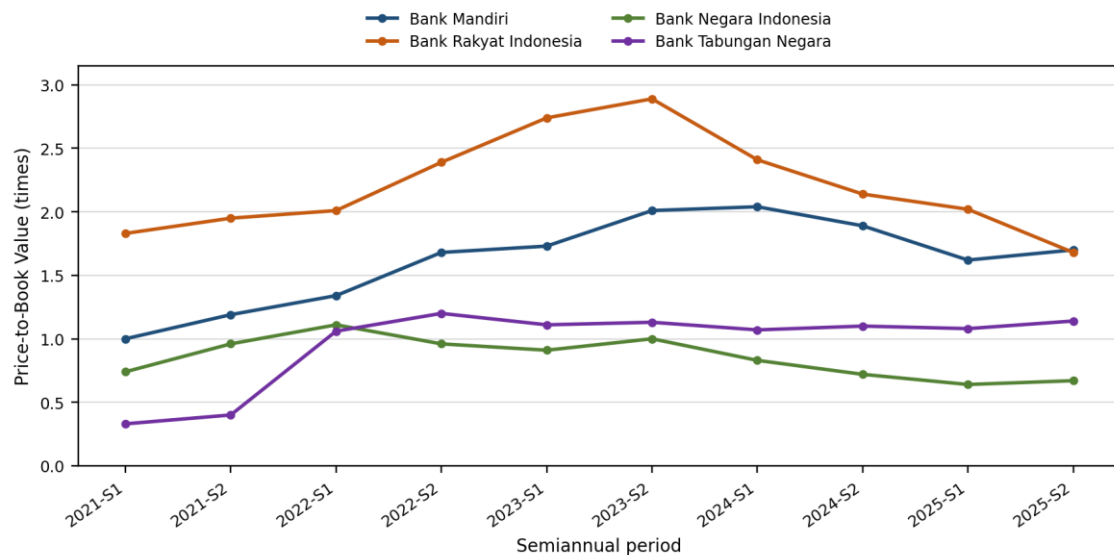


Figure 1. Semiannual PBV Trends of the Sampled State-Owned Banks, 2021–2025

Source: Authors' Calculations Based on the Study Data (2026).

Note: Each point uses the closing price on the final trading day of June or December (or the immediately preceding trading day). PBV uses equity attributable to owners and shares outstanding at the same semester-end date, with the price and share-count basis aligned for corporate actions.

Source: Processed data (2026)

The semiannual PBV trajectories in Figure 1 illustrate the relevance of bank-specific heterogeneity. Bank Rakyat Indonesia recorded the highest PBV for much of the period and peaked at 2.89 in the second half of 2023, before declining to 1.68 in the second half of 2025. Bank Mandiri's PBV increased through the first half of 2024 and then moderated. Bank Negara Indonesia's PBV generally remained near or below 1.00, whereas Bank Tabungan Negara's PBV improved from 0.33 in early 2021 and stabilized slightly above one from 2022 onward. These distinct valuation levels and paths are consistent with the possibility that persistent characteristics—such as business mix, perceived risk, customer franchise, and growth expectations—differ across the four banks.

Model selection followed the stated sequence. The Chow test evaluates the null that pooled common intercepts are adequate; $p = 0.0006$ rejects that null in favor of bank fixed effects. The Hausman test evaluates the null that random-effects estimates are consistent; $p = 0.0021$ rejects that null in favor of fixed effects. The Breusch–Pagan LM test evaluates the narrower null of no random-effect variance against the random-effects alternative; $p = 0.0863$ does not reject pooled effects. Because the Chow and Hausman tests both support fixed effects, the bank fixed-effects specification is retained.

Table 3. Panel-Model Selection And Diagnostic-Test Results

Test	Reported statistic	Probability	Decision/interpretation
Chow (cross-section chi-square)	17.357851	0.0006	FEM preferred over CEM
Hausman (cross-section random)	12.288547	0.0021	FEM preferred over REM
Lagrange Multiplier, Breusch–Pagan (both)	2.941335	0.0863	CEM preferred over REM
Residual normality, Jarque–Bera	1.219308	0.543539	Normality not rejected
Multicollinearity, centered VIF	1.483129 (DER and ROA)	—	No problematic multicollinearity
White heteroskedasticity, Obs*R ²	6.745817	0.2402	Homoskedasticity not rejected by this screen.
Breusch–Godfrey serial correlation, Obs*R ²	1.213909	0.2706	No first-order correlation detected by this screen

Source: Authors' calculations based on EViews 12 output (2026)

Table 3 reports the conventional diagnostic screens. The results do not reject residual normality, homoskedasticity, or first-order serial independence at 5%, and the VIF does not indicate severe collinearity. These findings are not sufficient to establish panel-robust inference. In particular, four banks provide too few cross-sectional clusters for standard cluster-robust approximations, and the archived output does not report cross-sectional-dependence or time-effects tests. The coefficient p-values below should therefore be read cautiously.

Table 4. Bank Fixed-Effects Estimates (Conventional Standard Errors)

Predictor	Coefficient	Std. error	t-statistic	Probability	Inference
Constant	−0.437260	0.485208	−0.901180	0.3738	Not significant
DER	0.184076	0.072391	2.542803	0.0157	Positive; provisional
ROA	0.517573	0.104937	4.932233	<0.001	Positive; provisional

Source: Authors' calculations based on EViews 12 output (2026)

Table 4 presents the archived bank fixed-effects estimates. Model metadata are: N = 40, four banks, ten semesters per bank, bank fixed effects included, time fixed effects not included, and conventional non-robust standard errors. The adjusted R² is 0.846809 and includes the bank effects. The archived output does not report within R², so the proportion of within-bank variation explained by DER and ROA cannot be isolated from this document.

$$PBV_{it} = -0.437260 + 0.184076 DER_{it} + 0.517573 ROA_{it} + \alpha_i + \varepsilon_{it}$$

DER has a coefficient of 0.184076 (conventional t = 2.542803; p = 0.0157). Holding ROA and bank fixed effects constant, a one-unit increase in DER is associated with a 0.184076-unit increase in PBV in the archived specification. This provides provisional support for H1 under conventional inference, but the result requires panel-robust verification.

ROA has a coefficient of 0.517573 (conventional $t = 4.932233$; $p < 0.001$). Because ROA is stored as percentage points (e.g., 2.28 rather than 0.0228), a one-percentage-point increase in ROA is associated with a 0.517573-unit increase in PBV, conditional on DER and bank fixed effects. This provides provisional support for H2 under conventional inference. Coefficient magnitudes should not be compared mechanically because DER and ROA use different units.

Table 5. Summary of Slope-Coefficient Tests

Hypothesis	Empirical result	Decision
H1: DER is positively associated with PBV	Coefficient = 0.184076; $p = 0.0157$	Tentative
H2: ROA is positively associated with PBV	Coefficient = 0.517573; $p < 0.001$	Tentative

Source: Authors' calculations based on EViews 12 output (2026)

Table 5 summarizes only the two slope hypotheses. The reported overall F-statistic of 44.11675 ($p < 0.001$) tests the full fixed-effects specification, including bank effects; it is not a joint restriction test for $\beta_1 = \beta_2 = 0$ and is therefore not used to support a separate H3. The adjusted R^2 of 0.846809 likewise includes persistent bank effects and cannot be attributed to DER and ROA alone.

Capital Structure and Firm Value

The positive DER coefficient indicates that, within the observed range of 4.75–7.88 times, higher DER and PBV moved together after absorbing time-invariant bank differences. It does not reveal whether investors viewed leverage favorably or whether a larger liability base caused valuation to rise. In banking, deposits and other operating liabilities can support earning assets, while lower equity capitalization can also increase risk; the coefficient cannot distinguish these channels.

The result is best viewed as banking-context evidence rather than confirmation of a universal leverage mechanism. Bank valuation studies show that profitability, capital adequacy, asset quality, liquidity, and operating efficiency can all matter for PBV (Bogdanova et al., 2018; Ika et al., 2023; Wiadnyani & Artini, 2023). Omitting those variables may leave DER correlated with unobserved changes in risk or capitalization.

Nevertheless, the result differs from Dzulhijar et al. (2021), who found that higher DER reduced firm value. The divergence underscores the contextual nature of the leverage–value relationship. Ownership characteristics, prudential regulation, depositor confidence, the perceived likelihood of government support, and differences in sample periods may alter how investors price bank leverage. The positive coefficient in this study should therefore not be interpreted as evidence that unlimited leverage increases value. Rather, it indicates that leverage was positively associated with valuation within the observed DER range of 4.75–7.88 and under the institutional conditions prevailing during 2021–2025.

Profitability and Firm Value

The positive ROA coefficient is consistent with a higher market premium accompanying stronger earnings from the asset base. The result aligns with Indonesian banking evidence reported by Muhammad (2022), Ika et al. (2023), and Wiadnyani and Artini (2023). It remains an association: the model does not establish that profitability caused PBV to rise or exclude reverse adjustment between market valuation and bank decisions.

The pooled data show substantial variation in ROA (0.42%–4.03%) and PBV (0.33–2.89 times), while Figure 1 demonstrates persistent valuation differences across banks. Bank fixed effects remove time-invariant level differences, but the model does not estimate bank-specific slopes or a mechanism. The ROA coefficient should therefore be interpreted as an average within-sample association conditional on DER and fixed bank effects.

Recent bank-valuation research indicates that profitability is one component of PBV alongside capital quality, asset risk, operating costs, and franchise characteristics (Bogdanova et al., 2018; García Martínez et al., 2024). The present two-variable model provides a focused post-pandemic comparison for state-owned banks, not a complete valuation model.

Theoretical Implications

The theoretical contribution is deliberately bounded. The study does not extend signaling or trade-off theory; it shows why their standard leverage interpretation must be qualified for deposit-taking banks. In this setting, DER combines operating funding and capitalization, while ROA summarizes earnings from the regulated asset base. The 2021–2025 state-owned-bank panel supplies context-specific evidence on these two indicators after controlling for time-invariant bank heterogeneity.

This qualification is consistent with bank-valuation research in which deposits, capital adequacy, asset quality, and profitability jointly shape market-to-book ratios (Bogdanova et al., 2018; García Martínez et al., 2024). Accordingly, the positive DER coefficient should not be read as an argument for increasing leverage; it is limited to the observed range and specification.

The importance of bank fixed effects also implies that persistent characteristics—business mix, customer franchise, governance, asset quality, and ownership-related expectations—remain part of valuation. Future models should measure those factors directly and report their explanatory power.

Practical Implications

Cautious practical implication: managers and investors may monitor DER and ROA jointly with CAR, regulatory leverage, liquidity, NPLs, and funding costs. The estimates do not demonstrate that changing DER or ROA will cause PBV to change, but they indicate that these ratios contain valuation-relevant information within the sample.

For regulators and government shareholders, the results support transparent disclosure of profitability, capital, liquidity, and asset-quality measures so that market valuation can be assessed against the bank's risk-bearing capacity. These implications are interpretive and should not be treated as tested interventions.

For investors, a higher DER should not be evaluated in isolation because it may reflect deposit-funded intermediation, lower equity capitalization, or both. ROA should likewise be assessed for persistence and risk adjustment. The two ratios are screening indicators rather than a complete investment rule.

The results are limited by the census of only four banks, 40 semiannual observations, and a period containing post-pandemic recovery and subsequent market adjustment. Most importantly, four cross-sectional units provide a weak basis for conventional cluster-robust asymptotics, while the archived output reports non-robust standard errors and no within R^2 , time-effects sensitivity, or cross-sectional-dependence test. The parsimonious model also omits bank size, CAR, regulatory leverage, NPLs, liquidity, growth, dividend policy, interest rates, inflation, and market sentiment. Omitted-variable bias and reverse causality therefore remain plausible. Future work should re-estimate the raw panel with small-sample-appropriate robust inference, add time effects and prudential controls, and compare DER with CAR or equity-to-assets.

CONCLUSION

In the archived bank fixed-effects specification, DER and ROA are positively associated with PBV among four Indonesian state-owned banks during 2021–2025. The DER result is bounded by the observed range and should be interpreted in light of deposits, capitalization, and prudential risk, while the ROA result is consistent with profitability being valuation-relevant. Because the estimates use conventional standard errors, include only two time-varying predictors, and rely on four banks, they provide preliminary associational evidence rather than a causal basis for increasing leverage or prescribing managerial interventions.

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