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DER, Operating Leverage, and Financial Stability in Indonesian Banks (2020–2024) : A Correlation Analysis

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ABSTRACT
Banking financial stability is a multidimensional issue that underpins the resilience of Indonesia's financial system, particularly in a dual-banking landscape where Islamic and conventional banks are exposed to similar macro-financial shocks but may exhibit distinct risk dynamics shaped by Shariah-compliant intermediation, contract structures, and depositors' return expectations. This study aims to examine the relationship between the Debt-to-Equity Ratio (DER), Operating Leverage (OL), and banking financial stability, measured using the Stability of the Financial System ratio (SRFS) in Indonesia. A quantitative approach is applied using Spearman's rank correlation, as one variable (OL) fails to satisfy normality based on the Shapiro–Wilk test. Secondary data are obtained from annual reports and official statistics published by Bank Indonesia for the 2020–2024 period. Descriptive results indicate mean values of 99.48 for DER, 1.392 for OL, and 0.134 for SRFS, with fluctuations reflecting notable financial dynamics over the observation period. The findings suggest that DER tends to increase, potentially elevating financial risk, while the relatively stable OL indicates consistent operational efficiency. However, variations in SRFS point to the banking system's vulnerability to external pressures. This study offers implications for regulators and industry stakeholders in designing risk-mitigation policies, strengthening capitalization, and enhancing resilience supervision to support the stability of the national banking sector, including the advancement of financial stability research in Islamic banking in Indonesia.

Keywords: Debt to Equity Ratio; Financial Risk; Financial Stability; Indonesian Banking; Operating Leverage

INTRODUCTION

Banking financial stability is a critical component of financial-system resilience, not only at the national level but also in a global context, because shocks can spread across borders through interconnected financial institutions and funding markets [1]. In dual-banking systems where Islamic and conventional banks operate side by side stability analysis should also account for risk characteristics specific to Islamic banking that may be shaped by contractual structures and depositor expectations, including displaced commercial risk, which can generate liquidity pressures when banks seek to maintain competitive returns [2]. Along these lines, internal bank indicators such as financial leverage and operating leverage are

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relevant for assessing banks' resilience to economic stress and earnings volatility; financial leverage is commonly proxied by the Debt-to-Equity Ratio (DER), while operating leverage (OL) reflects the sensitivity of profits to changes in revenue, which is influenced by the composition of fixed versus variable costs [3][4] [5].

Within the framework of maintaining banking system stability, two internal financial indicators—financial leverage and operating leverage play an interrelated and critical role in determining a bank's resilience to economic pressures and market volatility [6]. Financial leverage, commonly measured by the Debt to Equity Ratio (DER), reflects the extent to which a bank finances its assets using debt as opposed to its own equity. A high reliance on debt (high leverage) can enhance a bank's capacity to generate greater returns for shareholders during favorable market conditions, as it allows the bank to accumulate larger assets using external funds. Nevertheless, a capital structure that relies excessively on debt also poses significant systemic risks. In a declining economic environment, highly leveraged banks become particularly vulnerable to liquidity pressures, increased interest expenses, and potential defaults on short-term obligations [7]. [8] Emphasizes that high levels of leverage, if not accompanied by adequate risk governance and capital buffers, can accelerate the transmission of financial crises across the banking system.

Meanwhile, operating leverage measures the sensitivity of a bank's profits to changes in revenue, influenced by its cost structure particularly the proportion of fixed versus variable costs. High OL indicates that a large portion of a bank's costs are fixed, such as expenses related to buildings, IT systems, and managerial salaries, which are not easily adjusted in the short term. In periods of revenue growth, high OL can be beneficial, as profit margins expand more rapidly. However, in adverse conditions such as economic slowdowns or rising non-performing loans (NPLs) banks with high OL tend to experience sharper profit declines, potentially leading to operational losses [9].

Therefore, operating leverage is a key determinant of financial performance volatility and long-term banking stability. The combination of funding structure (leverage) and cost efficiency reflects a bank's adaptive capacity in responding to external dynamics and sudden shifts in the banking business climate [10]. Although the determinants of banking financial stability have been widely studied, most prior research has primarily emphasized macroeconomic factors such as inflation, interest rates, exchange rates, and economic growth thereby viewing bank stability as largely driven by external, aggregate level conditions [11]. As a result, empirical evidence on how internal bank conditions particularly capital structure leverage and cost-structure rigidity comove with financial stability remains relatively limited, including in dual-banking environments where Islamic banks may face distinctive risk pressures related to depositor behavior and liquidity management [12]. This gap is important because internal indicators such as the Debt-to-Equity Ratio and Operating Leverage may be associated with banking financial stability, yet their empirical relationships have not been consistently examined using correlation-based evidence.

To address this gap, this study employs correlation analysis to examine the direction and strength of the relationships between DER, OL, and banking financial stability (SRFS). A non-parametric Spearman approach offers a practical advantage

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when distributional assumptions are not fully satisfied, enabling a more robust assessment of monotonic relationships in banking data. From an industry perspective, identifying whether higher DER or greater OL tends to be associated with weaker or stronger stability provides actionable insights for bank management and regulators in setting risk limits, strengthening capital and liquidity planning, and improving cost-structure efficiency as part of early risk monitoring and resilience-building.

Grounded in capital-structure and risk return considerations, financial leverage reflects how strongly a bank's solvency and loss absorbing capacity depend on its equity buffer, implying that higher leverage proxied by the Debt to Equity Ratio (DER) can increase vulnerability to adverse shocks and potentially weaken financial stability when risks materialize. From a cost structure perspective, operating leverage (OL) captures the extent to which profits respond to changes in revenue due to fixed cost rigidity; therefore, higher OL may amplify earnings volatility and affect stability, particularly during downturns or periods of declining operating income. Building on this conceptual link between a bank's funding structure (DER), cost structure (OL), and its resilience, this study examines the relationship between DER, OL, and banking financial stability measured by the Stability of the Financial System ratio (SRFS) in Indonesia using a non parametric correlational approach. Using secondary data from official Bank Indonesia reports for 2020–2024, the study provides empirical evidence that can support policymakers, regulators, and industry practitioners in strengthening risk monitoring, capital planning, and cost efficiency strategies to enhance banking-sector resilience amid increasingly complex global dynamics.

METHOD

This study employs a quantitative approach with correlational analysis to examine the relationship between the Debt to Equity Ratio, Operating Leverage, and Financial Stability in the context of the Indonesian banking sector. The data used are secondary data obtained from official reports of Bank Indonesia (BI) for the period 2020–2024. The data used in this study are derived from Bank Indonesia's annual reports and regularly published banking statistics reports. The variables analyzed in this study include total debt and equity, which are used to calculate the Debt to Equity Ratio; net income and fixed costs as the basis for calculating Operating Leverage; total assets and total liabilities as the main components in assessing Financial Stability; and the comparison of total assets in year t and t-1, which is used to observe changes in the financial condition of banks over time.

This study employs correlation analysis because the primary objective is to examine the direction and strength of association among key internal indicators Debt to Equity Ratio and Operating Leverage and banking financial stability, rather than to build a causal model or estimate marginal effects under multiple control variables. Correlation analysis is particularly appropriate as an initial empirical assessment when the focus is on co-movement patterns that can inform monitoring and early-warning insights for industry and regulators, while keeping the inference strictly at the level of association (not causation).

To ensure methodological robustness, the choice of Spearman's rank correlation is justified by the distributional characteristics of the data. Normality testing using the Shapiro Wilk test indicates that not all variables are normally distributed: DER is normally distributed (p = 0.978) and SRFS is normally distributed (p = 0.503), whereas OL is not normally distributed (p = 0.004). Given this non-normality, Spearman's correlation is preferred over Pearson's correlation because it does not require normality and is suitable for assessing monotonic relationships.

While regression analysis is a well-established approach for secondary data, it typically aims to estimate conditional relationships under model specifications and assumptions (e.g., functional form, error structure, and sufficient information for reliable parameter estimation). In contrast, Spearman correlation offers strengths that match this study's design: it is non-parametric, less sensitive to distributional violations, and provides a transparent measure of association that supports scientifically sound but appropriately bounded conclusions. Accordingly, the study reports correlation coefficients (magnitude and sign) along with statistical significance using a 5% threshold ($p \leq 0.05$), where positive values indicate that increases in one variable tend to be associated with increases in another, and negative values indicate an inverse association.

The analytical steps in this study began with the collection of banking financial ratio data obtained from official sources such as Bank Indonesia (BI), the Financial Services Authority (OJK), and relevant financial reports. Once the data were collected, a normality test was conducted using the Shapiro-Wilk Test to determine whether the data distribution met the assumption of normality. Subsequently, the relationships between variables were analyzed using the Spearman Correlation Test, with a significance level set at 5% ($\alpha = 0.05$). The results of this analysis were then interpreted to draw conclusions and explain the implications of the findings for the condition of the banking sector in Indonesia.

RESULTS AND DISCUSSION

Descriptive Analysis of DER, OL, and SFRS Structures

Descriptive analysis was conducted to obtain a general overview of the statistical characteristics of the main variables under study, namely the Debt to Equity Ratio, Operating Leverage, and Financial Stability, within the context of the Indonesian banking sector during the 2020–2024 period. The purpose of this analysis is to identify data distribution patterns, year-to-year variability, as well as trends in average and extreme values that may serve as a basis for understanding the financial dynamics of the banking sector. Table 1 presents a summary of the descriptive statistics for each analyzed variable.

Table 1. Descriptive Statistics of DER, OL, and SRFS Variables in the Indonesian Banking Sector (2020–2024)

Variabel	Mean	Median	Std Dev	Min	Max
DER	99.48	101.44	12.998	81.71	116.77
OL	1.392	1.33	0.146	1.31	1.65

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Variabel	Mean	Median	Std Dev	Min	Max
SRFS	0.134	0.12	0.097	0.03	0.29

During the 2020–2024 period, the Financial Leverage ratio (DER) in Indonesia's banking sector recorded an average of 99.48, with a minimum value of 81.71 and a maximum of 116.77. A standard deviation of 12.998 indicates considerable variation across years in banks' reliance on debt-based funding sources. Although DER values generally remain within a reasonable range, the upward trend above the average in certain years suggests that some banks have begun to show a tendency to rely more heavily on debt within their capital structure. This condition may heighten financial risk if it is not accompanied by adequate risk management and prudent debt-burden management [13].

Meanwhile, the OL ratio shows an average of 1.392 over the five-year observation period, with a minimum of 1.31 and a maximum of 1.65. The relatively low standard deviation of 0.146 indicates that the OL ratio tends to be stable across years, reflecting consistency in banks' operating fixed-cost structure. This stability may be interpreted as a signal of operational efficiency, particularly in managing fixed costs amid revenue fluctuations. With OL remaining within a reasonable range, Indonesian banks appear sufficiently adaptive to revenue dynamics and maintain a well-controlled cost structure [14].

Financial Stability, as measured by the SRFS ratio, records an average of 0.134, with values ranging from 0.03 to 0.29. The standard deviation of 0.097 indicates substantial fluctuations in banks' financial stability over the past five years. Lower SRFS values in certain years may reflect financial pressures faced by banks, such as those arising from the COVID-19 pandemic or significant shifts in macroeconomic policy [15]. Nevertheless, rising SRFS values in subsequent years indicate a positive recovery, which may reflect the success of banks' adaptation strategies in strengthening financial resilience against external challenges.

Normality Test of Data

The normality test in this study was conducted using the Shapiro-Wilk method for three main variables, namely Debt to Equity Ratio (DER), Operating Leverage (OL), and Financial Stability (SRFS). The test results indicate that DER has a p-value of 0.978, which statistically suggests a normal distribution. This finding is further supported by the distribution visualization that appears symmetrical and closely follows the normal curve in Figure 1. In contrast, the Operating Leverage (OL) variable shows a p-value of 0.004, which is below the 0.05 threshold. This indicates that OL is not normally distributed statistically. This finding aligns with the distribution visualization, which deviates from the normal pattern, reinforcing the methodological decision to use a non-parametric approach in analyzing the relationships between variables.

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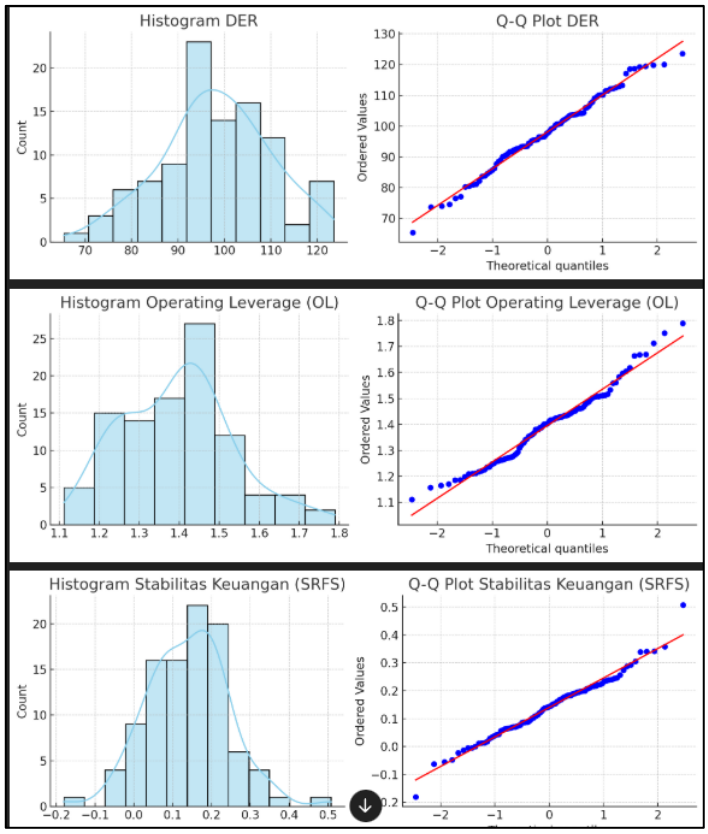

Figure 1. Data Normality Test

For the SRFS variable, the Shapiro–Wilk test produced a p-value of 0.503, which statistically satisfies the normality assumption. However, the distribution visualization in Figure 1 shows a dispersion pattern that tends to be asymmetric and deviates from the normal curve. This inconsistency between the statistical result and the visual shape highlights the importance of considering both approaches when assessing data distribution. Therefore, although SRFS is numerically classified as normally distributed, the correlation analysis was still conducted using Spearman's method to preserve the validity and reliability of the results. Accordingly, because at least one variable does not meet the normality assumption, Pearson's method—commonly used for normally distributed data—was not applied. Spearman's rank correlation was selected as a more appropriate alternative because it does not require any specific distribution and can measure monotonic relationships between variables more reliably, particularly in the context of non-normal data such as OL.

Correlation between DER, OL, and SRFS

To evaluate the relationships among the variables analyzed in this study, two approaches were employed: linearity visualization and statistical correlation analysis. Scatter plot visualization was used to provide an initial overview of the relationship patterns between variables, specifically Debt to Equity Ratio, Operating Leverage, and Financial Stability. Figure 2 below illustrates the pattern of relationships formed among these variables.

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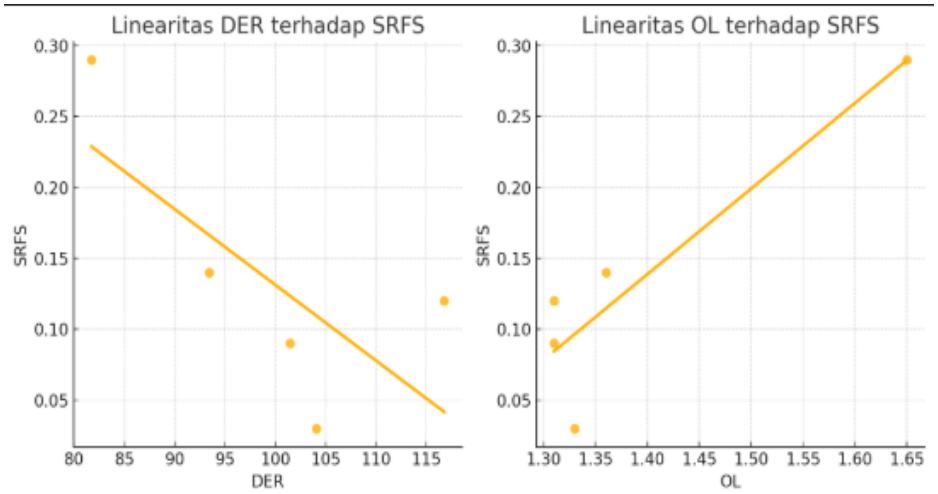

Figure 2. Scatter Plot of the Relationship between DER and OL with SRFS

The relationship between DER and SRFS in Figure 2 appears to be negative, suggesting that increases in DER tend to be followed by decreases in SRFS. In contrast, OL shows a generally positive association with SRFS, indicating that higher operating leverage tends to be accompanied by greater banking financial stability. Nevertheless, this visual interpretation is exploratory and should be corroborated using a more objective statistical approach. Accordingly, Spearman's rank correlation was employed as an appropriate non-parametric method given the data's distributional characteristics, as discussed in the preceding section. Table 2 reports the results of the Spearman correlation test among the study's three main variables.

Table 2. Spearman's Rank Correlation Results among DER, OL, and SRFS

Variabel	DER	OL	SRFS
DER	1.000	-0.821 (p = 0.089)	-0.700 (p = 0.188)
OL	-0.821 (p = 0.089)	1.000	0.667 (p = 0.219)
SRFS	-0.700 (p = 0.188)	0.667 (p = 0.219)	1.000

The Spearman correlation test results between the Debt-to-Equity Ratio, Operating Leverage, and Financial Stability in the context of Indonesian banking during the 2020–2024 period indicate several noteworthy relationships. The sign of the correlation coefficient indicates the direction of the relationship negative means the variables tend to move in opposite directions, while positive means they tend to move in the same direction whereas the magnitude indicates the strength of association; however, because all p-values are greater than 0.05, these results should be interpreted as empirical tendencies/patterns of association rather than relationships statistically confirmed at the 5% level. A strong negative correlation is observed between DER and OL, although it is not statistically significant (p = 0.089). Conceptually, this negative relationship suggests that the higher the debt to equity ratio (greater leverage), the lower the level of operating leverage. In the banking context, a high DER reflects greater reliance on debt-based funding, which may increase liquidity and solvency risk [16]. [17], Bank Indonesia and the broader banking system faced major challenges due to the COVID-19 pandemic, as many

banks experienced declining operating income and increased dependence on external funding sources. The decline in OL alongside a rise in DER may indicate that banks' operating structures became less favorable, potentially reflecting a heavier fixed-cost burden and reduced financial flexibility amid heightened economic uncertainty [18]. Because the correlation is negative, the empirical pattern implies DER tends to increase when OL decreases, and vice versa. Although the p-value does not reach conventional significance ($p = 0.089$), the relatively large correlation coefficient (-0.821) remains important to consider when evaluating structural trends in the banking sector.

The negative relationship between DER and SRFS suggests that the higher a bank's debt level, the lower its financial stability. However, with $p = 0.188$, this correlation is not statistically significant. In Indonesia's banking sector over 2020–2024, key drivers of financial stability included Bank Indonesia's monetary stimulus policies and the pandemic's impact on credit quality [19]. Elevated DER in some banks may signal increased systemic risk [20], particularly if the debt originates from unsustainable sources or if non-performing loans (NPL) rise. The decline in SRFS associated with higher DER may also reflect greater exposure to credit and liquidity risks. A negative DER–SRFS correlation means higher DER tends to be associated with lower SRFS, whereas lower DER tends to be associated with higher SRFS. Although not statistically significant, this relationship underscores the importance of prudential policies in managing bank capital.

The positive correlation between OL and SRFS indicates that higher operating leverage tends to be associated with higher financial stability, although this relationship is also not statistically significant ($p = 0.219$). [21] Theoretically, higher operating leverage implies that a bank carries a larger share of fixed costs in its operating cost structure. If a bank can maintain stable revenues, an increase in OL may contribute to financial stability. However, during 2020–2024, pandemic-driven uncertainty placed pressure on many banks' profit margins. Banks with high OL but declining revenues may face stronger liquidity pressures [22]. A positive OL–SRFS correlation means OL tends to move in the same direction as SRFS in this sample; nevertheless, because it is not significant at the 5% level, the appropriate conclusion is an observed tendency of association rather than definitive evidence. The lack of statistical significance may reflect substantial heterogeneity in operating strategies across Indonesian banks during this period, where large banks may be better able to manage operational risk than small and mid-sized banks that are more exposed to market volatility.

CONCLUSION

The correlation analysis reveals relationship patterns that, while not statistically significant at the 5% level, remain informative for describing dynamics in the Indonesian banking sector. The findings suggest that financial leverage (DER) tends to be negatively associated with operating leverage (OL) and financial stability (SRFS), whereas OL tends to be positively associated with SRFS. However, since the p-values exceed 0.05, these results should be interpreted as empirical association tendencies and should not be treated as causal evidence.

From a theoretical (academic) perspective, this study enriches the discussion on banking stability determinants by positioning internal indicators funding structure (DER) and operating/cost structure (OL) as complementary dimensions beyond explanations driven purely by macroeconomic factors. In this way, the study offers empirical grounding for the idea that bank stability can be discussed through the interplay of leverage, operating cost characteristics, and resilience under stress conditions.

From a managerial (industry) perspective, the negative DER–SRFS tendency highlights the practical importance of maintaining a balanced funding structure and adequate capital buffers as part of resilience planning. The positive OL–SRFS tendency suggests that efficiency-oriented operating structures may align with stronger stability; nevertheless, banks should also manage fixed-cost rigidity to avoid sharp profitability deterioration when revenues weaken. Practically, DER and OL can be used as early monitoring indicators to complement existing risk dashboards and support decisions related to capital, funding, and operating efficiency.

For regulators and supervisors, these results underscore the value of jointly monitoring leverage (DER) and operating structure (OL) as part of preventive supervision and bank resilience assessment. Future studies may strengthen the evidence base by extending the observation period, segmenting banks (e.g., by size), and applying methods that control for confounding factors to test whether the observed directions remain consistent.

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