Original Article

Check for updates

Available online at
www.heca-analitika.com/ijma

Indatu Journal of Management and Accounting

Vol. 3, No. 2, 2025

How Financial Ratios and Firm Size Affect Profitability: Evidence from Chemical Industry in Indonesia

Mirzatul Kadri [1,*], Zahara Muzaiyanah [2], Wisnu Satria [1], Taufiq C. Dawood [1], Kamal Fachrurrozi [1] and Ichwan Ichwan [1]

[1] Department of Development Economics, Faculty of Economics and Business, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia; mirzatulkadri@usk.ac.id (M.K.); wisnusatria@usk.ac.id (W.S.); taufiq.dawood@usk.ac.id (T.C.D.); kafazi90@usk.ac.id (K.F.); ichwan@usk.ac.id (I.I.)

[2] Department of Management, Faculty of Economics and Business, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia; muzaiyanazahara@gmail.com (Z.M.)

* Correspondence: mirzatulkadri@usk.ac.id

Article History

Received 3 October 2025
Revised 28 November 2025
Accepted 6 December 2025
Available Online 14 December 2025

Keywords:
Profitability
Financial ratios
Firm size
ROA
Chemical industry
Indonesia

Abstract

This study investigates the impact of financial ratios and firm size on the profitability of companies in the chemical industry listed on the Indonesia Stock Exchange (IDX) during the period 2019–2023 . Profitability is measured using Return on Assets (ROA), while the independent variables include Working Capital to Total Assets (WCTA), Current Ratio (CR), Debt to Equity Ratio (DER), Total Asset Turnover (TAT), and Firm Size (SZ). A quantitative approach was employed using multiple linear regression analysis. The sample consisted of 25 chemical companies selected through purposive sampling. The findings reveal that CR, TAT, and SZ have a significant positive effect on ROA, while DER has a significant negative effect. WCTA, however, shows no significant impact on profitability. The adjusted R^2 value of 0.742 indicates that 74.2% of the variation in profitability can be explained by the model. These results highlight the importance of liquidity management, efficient asset utilization, optimal capital structure, and firm scale in driving profitability in the chemical sector. The study provides valuable insights for company management, investors, and policymakers in enhancing financial performance and strategic decision-making within the industry.

1. Introduction

The chemical industry has an important role in the Indonesian economy with its considerable contribution to manufacturing output, employment, and exports. Based on data from the Statistics Indonesia (BPS) in 2023, the chemical industry contributed 1.75% to Indonesia's Gross Domestic Product (GDP) from the non-oil and gas processing industry sector. This contribution places the chemical industry as the second largest contributor, after the food and beverage industry which recorded the highest contribution of 6.55%. This percentage also exceeds the contribution of other major industries, such as the basic metal industry (0.94%), the transportation equipment industry (1.49%), and the metal goods, computers, electronic goods, optics, and electrical equipment industry (1.57%) [1]. This data reflects the important role of the chemical industry in supporting the performance of the national manufacturing sector and strengthening overall industrial growth.

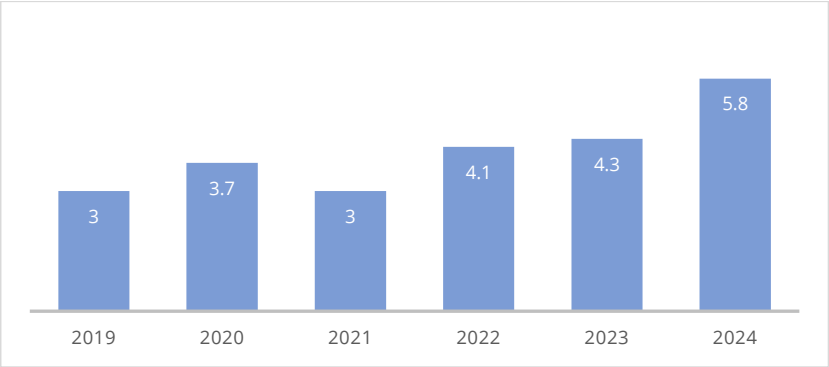

Figure 1. Percentage growth trend for chemical, pharmaceutical and textile industries in Indonesia. Source: Statistics Indonesia [2].

Figure 1 illustrates a generally upward growth trend in Indonesia's chemical, pharmaceutical, and textile industry over the 2019-2024 period. Starting from a growth rate of 3.0 percent in 2019, the sector expanded to 3.7 percent in 2020 before easing back to 3.0 percent in 2021, indicating a temporary slowdown likely associated with pandemic-related disruptions. Growth then accelerated to 4.1 percent in 2022 and 4.3 percent in 2023, reflecting a phase of recovery and strengthening industrial activity. By 2024, the sector's growth reached 5.8 percent, marking the highest rate in the period and suggesting robust momentum and improving performance in this strategic industrial group.

This research is focused on the chemical industry in Indonesia because this industry acts as an upstream sector that supplies raw materials for various other industries, such as pharmaceuticals, textiles, food and beverages, and manufacturing. According to Ariadji et al. [3], the chemical industry has an important role in supporting national development because of its function as a major supplier that is required to have stable capacity and performance at all times. The industry has also shown a significant increase in the absorption of foreign direct investment (FDI) and domestic direct investment (DDI). Based on data from the Investment Coordinating Board [4], total investment realization in the chemical industry sector reached IDR 93.6 trillion in 2022, an increase of 97.05% over the previous year of IDR 47.5 trillion, making it the industry with the fifth highest investment realization out of a total of 23 sectors that year. Nonetheless, companies in this sector face complex financial challenges, mainly related to financial ratios and company size. Fluctuations in financial ratios such as liquidity, solvency, and profitability are major obstacles in maintaining healthy financial performance [5]. In addition, company size is also important to consider, where smaller companies are more vulnerable to financial pressures than large companies [6].

Financial ratios and company size are crucial to examine because profitability serves as a central measure of financial performance, indicating how effectively a firm converts its operations and scale into net earnings [7]. Both variables reflect the internal conditions of the company that can affect overall financial performance. Financial ratios, particularly profit margin, asset turnover, and financial leverage components of the Du-Pont model, serve as essential measurement tools for assessing a company's financial health and operational efficiency, enabling management and investors to evaluate the company's return on equity and identify key drivers of profitability for strategic decision-making [8]. Company size, as measured by the magnitude of total assets, determines the degree of managerial flexibility in asset deployment for operational activities; firms with larger asset bases possess greater capacity to allocate and utilize resources efficiently for operational purposes, thereby enabling management to mitigate business risk while maximizing profitability [9]. By considering the important role of these two factors, this topic is relevant to be further researched in the context of achieving company profitability.

This study uses profitability as the dependent variable which is measured by Return on Assets (ROA). It is chosen because it is the main indicator for assessing a company's financial performance and reflects the company's ability to generate profits from the total assets it owns. Additionally, ROA is often used as a benchmark for the company's financial efficiency and health. It is related to the company's value as well as investors' perceptions of the company's financial prospects. The independent variables used include financial ratios such as working capital to total assets (WCTA), current ratio (CR), debt to equity ratio (DER), total assets turnover (TAT), and firm size (SZ). These variables are considered to play important roles in influencing profitability based on findings from previous studies across various industrial sectors. Therefore, this study aims to analyze the

influence of these variables on profitability in the Indonesian chemical industry.

ROA is considered a key measure of financial efficiency and health in various sectors [10, 11]. Higher ROA is also associated with higher firm value, including Tobin's Q and market value, indicating investors' positive perceptions of a firm's financial prospects and operational efficiency [12]. Based on the literature, several internal variables are commonly identified as determinants of profitability. Working capital to total assets (WCTA) captures liquidity management and financial stability [13], the current ratio (CR) measures short-term liquidity and operational capability [14], and total asset turnover (TAT) reflects the effectiveness of asset utilization in generating revenue [15]. Higher debt-to-equity ratios (DER) increase financial leverage and debt-servicing burdens, which tend to reduce profitability [16]. Firm size (SZ) is also relevant because larger firms typically have better access to resources, economies of scale, and cost efficiencies that support higher profitability [17, 18].

Although these studies collectively demonstrate that liquidity, working capital management, leverage, asset turnover, and firm size are important determinants of profitability, most of the existing empirical evidence is concentrated in the food and beverage industry, general manufacturing, banking, or mixed industrial samples, and often outside the Indonesian chemical sector [19–23]. Empirical research specifically targeting the Indonesian chemical industry remains limited, and studies that simultaneously examine WCTA, CR, DER, TAT, and firm size with ROA as the performance indicator are still scarce. Even research that includes firms in the basic and chemical subsectors such as Viona et al. [24] tends to focus on net profit growth rather than ROA and does not isolate the chemical industry as a distinct sector context. This indicates a research gap regarding how the combination of key financial ratios and firm size influences profitability in Indonesia's chemical industry, which is characterized by high capital intensity, volatility in raw material prices, and exposure to global demand cycles.

The chemical sector plays a strategic upstream role in Indonesia's industrial structure and has recently attracted significant investment. However, empirical studies focusing specifically on the profitability determinants of this sector remain limited, as prior research has predominantly examined food and beverage, general manufacturing, or mixed industry samples [19, 21–24]. This gap highlights the need for industry-specific evidence that reflects the financial characteristics and operational dynamics of the Indonesian chemical industry.

This study provides several contributions. For academics, it enriches the literature by offering empirical evidence from a sector that has received relatively little scholarly attention. For investors, it underscores the importance of liquidity, leverage, asset utilization and firm size in evaluating investment opportunities, particularly in light of economic uncertainty and volatile input prices, as supported by Mahima Ima et al. [20]. For company management, the results offer practical insights into which financial aspects require greater strategic focus to enhance profitability.

To address this gap, this study aims to examine the effect of Working Capital to Total Assets (WCTA), Current Ratio (CR), Debt to Equity Ratio (DER), Total Asset Turnover (TAT), and Firm Size (SZ) on profitability—measured by Return on Assets (ROA)—in chemical companies listed on the Indonesia Stock Exchange (IDX) during the period 2019–2023. By focusing on a sector with strategic importance and growing investment activity, the study is expected to contribute both theoretically and practically to a more comprehensive understanding of profitability dynamics in Indonesia's chemical industry.

2. Literature Review

2.1. Theoretical Foundations

Financial performance reflects the extent to which a company's financial decisions translate into value creation for its shareholders. Among various indicators, profitability is widely regarded as a primary measure of financial stability and overall performance, as it represents the financial gains generated relative to the resources employed [22]. In this context, Return on Assets (ROA) is an important indicator because it captures the firm's ability to generate profit from its total assets and therefore reflects both operational efficiency and investment effectiveness [10, 11] A higher ROA is generally associated with higher firm value and more favorable investor perceptions of a company's financial prospects [12].

The relationship between profitability and internal financial indicators can be explained using the Du-Pont framework, which decomposes profitability into margin, turnover, and leverage components. In this framework, profit margin reflects the firm's ability to convert sales into profit, asset turnover captures the efficiency of asset utilization in generating revenue, and financial leverage reflects the use of debt financing to magnify returns [8]. This study focuses on several ratios that are closely related to the Du-Pont logic, namely liquidity indicators, asset turnover, and leverage, as well as firm size as a structural characteristic of the firm.

First, working capital management and liquidity theory emphasize the trade-off between liquidity and profitability. Companies need sufficient working capital and liquid assets to meet short-term obligations and avoid financial distress, but excessive liquidity may reduce returns because idle resources do not generate sufficient income [13]. Working capital to total assets (WCTA) indicates the proportion of current assets financed within the firm's asset structure and reflects the firm's ability to support day-to-day operations. Ineffective working capital management can significantly reduce a company's profitability and may even trigger financial distress despite firm size and business orientation [25]. The current ratio (CR), as a key liquidity ratio, measures the firm's capacity to meet short-term liabilities with current assets and thus captures the firm's short-term financial flexibility [14]. An optimal level of liquidity is therefore essential to maintain operational continuity while still allowing assets to be used productively.

Second, activity or productivity ratios theory focuses on how effectively firms utilize their asset base to generate sales. The total asset turnover (TAT) ratio measures how efficiently a company converts its total assets into revenue, and thus reflects the quality of asset utilization [26]. A higher TAT indicates that management can generate more sales from a given level of assets, which is generally associated with higher profitability, all else being equal. From the Du-Pont perspective, higher asset turnover directly supports higher returns by increasing revenue relative to the asset base [8, 24].

Third, the relationship between capital structure and profitability is grounded in capital structure theories such as the trade-off theory and the pecking order theory. The trade-off theory suggests that firms balance the tax benefits of debt against the expected costs of financial distress, while the pecking order theory posits a financing hierarchy in which internal funds are preferred over debt and equity. In practice, higher leverage, as measured by the debt to equity ratio (DER), can increase the return to shareholders when the firm's return on assets exceeds the cost of debt, but excessive leverage raises financial risk and interest burden, which may eventually reduce profitability [16, 21]. Empirical findings often show that beyond a certain threshold, high leverage is associated with lower profitability due to increased financial costs and risk exposure [20].

Finally, firm size theory highlights the role of scale and resource endowments in determining firm performance. Larger firms tend to benefit from economies of scale, greater market power, and better access to financial and technological resources, which can improve their ability to generate profits [17, 18]. Firm size, commonly proxied by the logarithm of total assets, is therefore considered a fundamental organizational characteristic affecting profitability [9, 27]. Larger asset bases can be deployed more flexibly, allowing firms to diversify risk, invest in productivity-enhancing technologies, and negotiate more favorable terms with suppliers and creditors, which in turn may lead to higher profitability.

Based on these theoretical foundations, the present study focuses on WCTA and CR to represent liquidity and working capital management, TAT to represent asset utilization efficiency, DER to capture leverage and capital structure decisions, and firm size (SZ) to capture the structural advantages associated with scale. All of these variables are expected to influence profitability as measured by ROA.

2.2. Previous Empirical Studies

A number of empirical studies have examined the effects of financial ratios and firm size on profitability across different industries, providing important justification for the choice of variables in this study. Regarding working capital and liquidity, Kabir et al. [13] analyze the relationship between working capital, firm profitability, and firm size, and find that working capital is significantly related to profitability, indicating that efficient working capital management is crucial for sustaining firm performance. Alade [25] emphasizes that poor working capital management remains a major cause of business failure, as insufficient liquidity can disrupt operations and lead to financial distress. In terms of liquidity ratios, Panigrahi & Joshi [14] and Ishak & Selamat [28] show that liquidity, proxied by the current ratio and other liquidity indicators, is positively associated with firm performance and market value, although excessively high liquidity may reflect underutilized resources. These findings support the inclusion of WCTA and CR as key explanatory variables related to firm profitability.

In the area of activity ratios and asset utilization, several studies highlight the importance of total asset turnover. Kurniani [26] explains that TAT measures how effectively a company uses its assets to generate sales and links this efficiency to sales-based performance. Viona et al. [24], focusing on manufacturing companies in the basic and chemical subsectors listed on the Indonesia Stock Exchange, find that financial ratios, including activity ratios, significantly influence net profit growth, underscoring the role of asset turnover in shaping profitability dynamics in sectors related to chemicals. Similarly, Irman & Purwati [21] document that total asset turnover has a significant effect on ROA in automotive and component companies, indicating that higher asset utilization efficiency leads to better profitability

outcomes. These empirical results justify the use of TAT as a proxy for operational efficiency in the present study.

Empirical evidence on leverage and profitability also appears robust. Abid et al. [16] find that higher leverage, as measured by DER, tends to reduce firm profitability due to the increased burden of debt servicing, particularly when firms are unable to generate returns above the cost of capital. Ayoush et al. [23] examined industrial enterprises and conclude that leverage generally has a negative impact on profitability, while liquidity and asset turnover positively affect performance, consistent with the notion that an overly high debt level undermines financial stability. Hutabarat et al. [29] further show that DER significantly affects ROA and dividend policy, reflecting the broader implications of leverage for financial performance and shareholder returns. However, Mahima Ima et al. [20] provide evidence from Bangladeshi firms that leverage can, under certain conditions, induce higher profitability, particularly when firms use debt strategically to finance profitable investments. Overall, the mixed but predominantly negative relationship between leverage and profitability supports the inclusion of DER as a key determinant of ROA in this study.

With respect to firm size, Niresh & Velnampy [22] report that larger manufacturing firms tend to exhibit higher profitability, suggesting that scale advantages play an important role in performance outcomes. Dang et al. [18] and Ho et al. [17] highlight that firm size not only captures scale but also reflects access to resources, reputation, and bargaining power, which can lead to more stable earnings and improved profitability. Fazria et al. [7] find that company size, alongside net profit margin, significantly influences financial performance in product sub-sector companies listed on the Indonesia Stock Exchange. Arifaj et al. [9] also show that firm size is positively related to financial performance, as larger firms can better manage cash flow, debt, and investment decisions. These findings provide strong empirical support for including firm size (SZ) as an explanatory variable in analyzing profitability.

Several studies have jointly examined financial ratios and firm size in the context of profitability. Larasati & Purwanto [19] analyze food and beverage companies in Indonesia using working capital to total assets, current ratio, debt to equity ratio, total asset turnover, inventory turnover, and firm size as determinants of ROA. They find that these variables collectively explain 51.35 percent of profitability, with DER having the most significant impact on ROA, while TAT, inventory turnover, and firm size are not individually significant. Ayoush et al. [23] investigate a broader set of industrial enterprises and conclude that liquidity and asset turnover positively affect profitability, whereas leverage reduces it, reinforcing the idea that an optimal combination of liquidity, efficiency, and moderate levels of leverage is needed to achieve sustainable profitability. Viona et al. [24] provide additional evidence from manufacturing firms in the basic and chemical subsectors, showing that financial ratios significantly affect profit growth, even though their focus is on net profit growth rather than ROA and does not isolate the chemical industry as a distinct sector.

Taken together, previous empirical studies consistently indicate that liquidity (WCTA, CR), asset turnover (TAT), leverage (DER), and firm size (SZ) are important determinants of firm profitability. However, most of this empirical evidence originates from the food and beverage industry, general manufacturing, or mixed industrial samples, and only a few studies explicitly consider firms in the basic and chemical subsectors without focusing exclusively on the chemical industry in Indonesia [19, 21, 24]. Moreover, prior research rarely examines the combined effect of WCTA, CR, DER, TAT, and firm size on profitability measured by ROA in a single, sector-specific model. Therefore, this study extends the existing literature by investigating how these financial ratios and firm size jointly affect ROA in chemical industry companies listed on the Indonesia Stock Exchange during the 2019–2023 period.

3. Materials and Methods

3.1. Research Design

This study employs a quantitative approach to analyze the relationship between various financial ratios and the profitability of companies. The method used is multiple linear regression, which aims to determine the simultaneous and partial effects of independent variables on the dependent variable profitability as measured by Return on Assets (ROA). The analytical framework adopts the Best Linear Unbiased Estimator (BLUE) assumptions, which include proper model specification, normality of residuals, homoscedasticity, no perfect multicollinearity among independent variables, and no serial correlation.

To provide readers with a clear and concise understanding of the variables used in this study, Table 1 summarizes each variable's status (dependent or independent), name, symbol used in the analysis, and a brief definition of what the variable represents. This helps clarify the role and operational meaning of each variable within the research model.

Table 1. Variable definitions used in this study.

Variable Status	Variable Name	Variable Symbol	Units	Variable Definition
Dependent	Profitability	ROA	Percent	Return on Assets, representing net income generated relative to total assets, used as a measure of firm financial performance.
Independent	Working Capital to Total Assets	WCTA	Ratio	Ratio of net working capital to total assets, indicating liquidity and operational support capacity.
	Current Ratio	CR	Ratio	Ratio measuring a firm's ability to meet short-term obligations with current assets, reflecting liquidity.
	Debt to Equity Ratio	DER	Ratio	Ratio of total debt to shareholders' equity, indicating the firm's financial leverage and risk level.
	Total Asset Turnover	TAT	Ratio	Ratio showing how effectively the company utilizes its assets to generate sales revenue.
	Firm Size	SZ	In log	Typically measured as the logarithm of total assets, representing the scale and resource capacity of the firm.

Table 2. List of companies analyzed.

No.	Ticker	Company Name
1	TPIA	PT Chandra Asri Petrochemical Tbk
2	BRPT	PT Barito Pacific Tbk
3	AVIA	PT Avia Avian Tbk
4	IMPC	PT Impack Pratama Industri Tbk
5	AGII	PT Aneka Gas Industri Tbk
6	SAMF	PT Saraswanti Anugerah Makmur Tbk
7	UNIC	PT Unggul Indah Cahaya Tbk
8	MLIA	PT Mulia Industrindo Tbk
9	AMFG	PT Asahimas Flat Glass Tbk
10	LTLS	PT Lautan Luas Tbk
11	FPNI	PT Lotte Chemical Titan Tbk
12	EKAD	PT Ekadharma International Tbk
13	APLI	PT Asiaplast Industries Tbk
14	ADMG	PT Polychem Indonesia Tbk
15	KONI	PT Perdana Bangun Pusaka Tbk
16	MDKI	PT Emdeki Utama Tbk
17	CLPI	PT Colorpak Indonesia Tbk
18	BMSR	PT Bintang Mitra Semestaraya Tbk
19	SRSN	PT Indo Acidatama Tbk
20	OKAS	PT Ancora Indonesia Resources Tbk
21	INCI	PT Intanwijaya Internasional Tbk
22	SBMA	PT Surya Biru Murni Acetylene Tbk
23	NPGF	PT Nippon Indosari Corpindo Tbk
24	DPNS	PT Duta Pertiwi Nusantara Tbk
25	KKES	PT Kimia Farma Diagnostika Tbk

3.2. Population and Sample

The population in this study comprises companies in the chemical industry listed on the Indonesia Stock Exchange (IDX). A total of 25 of 28 companies were selected as the sample using a purposive sampling method. The remaining three companies were excluded because they did not meet the criterion of having complete financial statement data. The screening process was conducted using the screener tool on Investing.com, which categorizes companies directly under the "chemical industry" classification without further industry sub-segmentation.

The selected companies met three criteria: they were listed consistently on the Indonesia Stock Exchange during 2019–2023, classified under the chemical industry according to Investing.com, and possessed complete and accessible financial data for the entire observation period. Three firms were excluded because they did not fulfill the data completeness requirement. PT Siwani Makmur Tbk (SMLE) lacked financial statements for 2019–2021, PT OBM Drilchem Tbk (OBMD) did not report financial statements for 2019–2020, and PT Chemstar Indonesia Tbk (CHEM) did not provide financial reports for 2019–2021. Thus, this study used 25 companies as samples. The list of companies analyzed in this study can be seen in Table 2.

3.3. Data Collection and Processing

The study uses secondary data obtained from the companies' audited financial statements published on the IDX and other official sources. The initial results indicated that the data did not follow a normal distribution. Therefore, a natural logarithm transformation was applied to the variables that exhibited non normality to achieve a more normally distributed data structure. All subsequent classical assumption tests and regression analyses were conducted using the transformed data set.

3.4. Research Model

The regression model used in this study is presented in Equation 1.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon \quad (1)$$

In this model, X_1 to X_5 denote five independent variables. To enhance clarity and strengthen the connection between the statistical specification and the financial constructs examined, Equation 2 replaces these generic

Table 3. Descriptive statistics.

Stat.	*Variable*					
	WCTA	**CR**	**DER**	**TAT**	**SZ**	**ROA**
Mean	-1.08	1.44	-0.71	-0.21	28.18	-3.18
Median	-1.19	0.90	-0.64	-0.13	27.75	-2.95
Max.	38.15	34.67	6.55	1.54	32.77	-1.41
Min.	-6.17	0.01	-3.00	-1.66	25.44	-7.82
Std. Dev.	4.11	3.48	1.23	0.63	1.75	1.10
Obs.	100	100	100	100	100	100

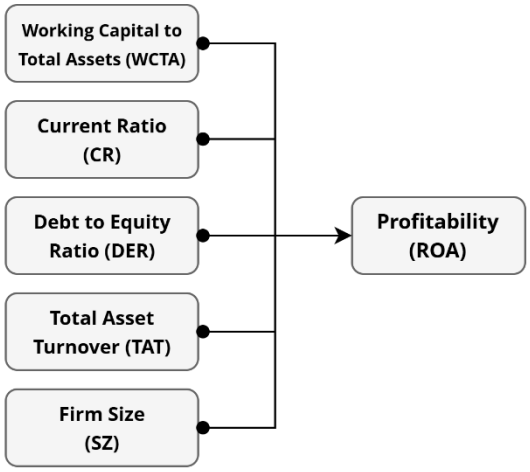

Figure 2. Conceptual framework of the study.

notations with the specific variable names WCTA, CR, DER, TAT, and SIZ.

$$ROA_{it} = \beta_0 + \beta_1 WCTA_{it} + \beta_2 CR_{it} + \beta_3 DER_{it} + \beta_4 TAT_{it} + \beta_5 SZ_{it} + \varepsilon_{it} \quad (2)$$

Here, the dependent variable represents Return on Assets (ROA), which serves as the primary indicator of company profitability and reflects how efficiently total assets are utilized to generate net income. The independent variable X_1, specified as WCTA, represents Working Capital to Total Assets, indicating the proportion of net working capital within the firm's total asset structure, which relates to liquidity management and operational capacity. X_2 (CR) is the Current Ratio, a measure of a firm's ability to meet short-term obligations using its current assets. X_3, expressed as DER, denotes the Debt to Equity Ratio, which reflects the balance between debt financing and equity financing and thus provides insight into leverage and financial risk. X_4 (TAT) corresponds to Total Asset Turnover, an efficiency indicator that shows the firm's effectiveness in generating revenue from its asset base. X_5 is represented by SZ (Firm Size), commonly measured using the logarithm of total assets to capture differences in scale and resource capacity across firms.

The intercept β_0 indicates the expected value of ROA when all independent variables are zero. The coefficients β_1 to β_5 show the estimated magnitude and direction of each independent variable's effect on ROA. The error term ε_i captures all other factors influencing profitability that are not included in the model. Presenting the model using the explicit variable names in Equation 2 improves interpretability and aligns the regression specification more closely with the financial concepts central to this study.

3.5. Hypotheses

The conceptual framework shown in Figure 2 indicates that firm profitability, proxied by Return on Assets (ROA), is determined by five key internal factors: Working Capital to Total Assets (WCTA), Current Ratio (CR), Debt to Equity Ratio (DER), Total Asset Turnover (TAT), and Firm Size (SZ). Each of these independent variables is represented as a separate box on the left side of the framework, with a directional arrow pointing toward ROA to depict their expected individual influence on firm profitability.

WCTA and CR capture the firm's liquidity and working capital management, DER reflects capital structure and leverage, TAT represents asset utilization efficiency, and SZ denotes the scale advantages associated with larger asset bases, all of which are expected to influence a company's ability to generate profits from its assets. Beyond their partial effects, these relationships collectively indicate that the five independent variables simultaneously influence ROA, highlighting that profitability in chemical industry firms is shaped by the integrated effects of liquidity, leverage, asset efficiency, and firm size.

4. Results and Discussion

4.1. Descriptive Statistics

This research was conducted on companies in the chemical industry listed on the Indonesia Stock Exchange (IDX) over the 2019 to 2023 period. Using a total of 100 observations, the study calculates the mean, median, maximum, minimum, and standard deviation based on the results of the descriptive analysis. According to Creswell & Creswell [30] descriptive statistical analysis provides information on the distribution of data, including measures such as the mean, median, standard deviation, and value range, which together summarize the characteristics of the dataset. These descriptive

Table 7. Multicollinearity test results.

Variable	WCTA	CR	DER	TAT	SZ
WCTA	1				
CR	0.0044	1			
DER	-0.0607	0.4068	1		
TAT	0.1629	0.0375	0.3388	1	
SZ	-0.1664	-0.1886	0.1476	-0.3208	1

Note: A correlation value below 0.8 indicate no high multicollinearity.

Table 4. Hausman test results.

Test Summary	Chi-Sq. Statistic	Prob.
Cross-section random	23.072	0.0003

Note: A probability value below 0.05 indicates that the fixed effects model is the most appropriate specification.

Table 5. One sample Kolmogorov-Smirnov test results.

Test Value	Unstandardized Residual
Stat.	0.153
Asymp. Sig. (2-tailed)	0.070***

Note: A probability value above 0.05 indicates that the residuals are normally distributed.

Table 6. Heteroscedasticity test results.

Model	Obs*R-squared	Prob. Chi-Square(5)
1	8.4740	0.1320

Note: A probability value above 0.05 indicates no evidence of heteroskedasticity.

Table 8. Durbin-Watson test result.

Test	Weighted Stat.
Durbin-Watson Stat.	2.1152

Note: A test statistic value between 1.7804 and 2.2196 indicates the absence of autocorrelation.

summaries are presented in the statistical output shown in Table 3.

4.2. Best Model Selection

The Hausman test assists researchers in determining whether fixed or random effects are more appropriate for a study. If the probability value is less than the predetermined significance level of 5%, the fixed-effects model is preferred. As shown in Table 4, the Hausman test result indicates that the fixed-effects model is the most suitable for this research.

4.3. Classical Assumption Tests

The first assumption test is the normality test. The Kolmogorov–Smirnov test result presented in Table 5 yields a significance value of 0.070, which exceeds the significance threshold of 0.05. This indicates that the data are normally distributed and meet the requirements of the normality test.

The next test is the heteroscedasticity test, which assesses whether there is unequal variance in the regression model from one observation to another. The Glejser test is used to determine the presence of heteroscedasticity in this study. Based on the probability value of Obs*R-squared in Table 6, which is 0.1320 (>0.05), it can be concluded that the data do not exhibit heteroscedasticity, indicating that the assumption of homoscedasticity has been met.

The subsequent test is the multicollinearity test, which aims to assess whether there is a correlation among the independent variables. If the independent variables are correlated, the variables are not orthogonal. According to the results in Table 7, the highest correlation matrix value is 0.406758, occurring between CR and DER. Since the correlation values for all independent variables are below 0.7, the results confirm that multicollinearity is not present in this study.

The final assumption test is the autocorrelation test. The result shown in Table 8 indicates that the Durbin–Watson statistic is 2.1152, which satisfies the requirement that $1.7804 \leq DW \leq 2.2196$. Therefore, it is concluded that there is no autocorrelation in this study.

4.4. Hypothesis Testing and Regression Results

Based on the results of the multiple regression analysis, the mean value of the dependent variable in this sample can be estimated using the other independent variables. Wooldridge [31] stated that the coefficient of determination (R^2) measures the proportion of the total variation in the dependent variable that is explained by the regression model. Table 9 presents the results, which are based on the five independent variables—WCTA, CR, DER, TAT, and SZ—with ROA as the dependent variable.

The first hypothesis concerns the impact of working capital to total assets on return on assets. The results show that the regression coefficient of WCTA is 0.012 with a significance value of 0.924, which is greater than the significance threshold of 0.05. Therefore, although the relationship is positive, the effect of WCTA on the dependent variable is not statistically significant.

The second hypothesis states that the current ratio affects return on assets in the Indonesian chemical industry. The CR regression coefficient is 0.142 with a significance value of 0.000. Since the significance value is

Table 9. Multiple regression analysis results.

Variable	Coef.	Std. Er.	t-Stat.	Prob.
C	-17.008***	1.985	-8.569	0.000
WCTA	0.012	0.124	0.096	0.924
CR	0.142***	0.030	4.711	0.000
DER	-0.792***	0.137	-5.783	0.000
TAT	0.692***	0.233	2.963	0.007
SZ	0.462***	0.070	6.617	0.000
Adj. R^2	0.742			
F-stat. (Prob.)	0.000***			

Note: *** indicates significance at the 1% level.

below 0.05, it can be concluded that CR has a positive and significant effect on ROA.

For the third independent variable, DER, the regression coefficient is -0.792, with a significance value of 0.000. The negative coefficient and the p-value below 0.05 indicate that DER has a significant negative effect on ROA. DER is essential for identifying the amount of capital provided to the business owner by creditors.

The next hypothesis is that TAT has a significant effect on return on assets. The TAT variable has a significance value of 0.007 and a regression coefficient of 0.692. Since the p-value is below 0.05, this indicates that TAT has a significant and positive influence on ROA.

SZ is the final independent variable. The regression results show a coefficient of 0.462 with a p-value of 0.000. Since the coefficient is positive and the significance value is below 0.05, SZ has a positive and significant impact on ROA.

Based on the multiple regression analysis, the adjusted R^2 value of 0.742 indicates that 74.2% of the variation in company profitability, as measured by ROA, can be explained by the independent variables WCTA, CR, DER, TAT, and SZ. The remaining 25.8% is influenced by other factors not examined in this study. In addition, the F-test results show a significance value of 0.000, which is below the 0.05 threshold, indicating that the independent variables collectively have a significant effect on the company's financial performance.

4.5. Discussion of Findings

The positive and significant effect of CR on ROA ($\beta > 0$, $p < 0.05$) aligns closely with Panigrahi & Joshi [14], who found that liquidity supports performance in volatile industries, and with Ishak & Selamat [28], who confirmed CR's role in enhancing market value through operational stability. This contrasts with the findings of Larasati & Purwanto [19], who reported an insignificant liquidity effect in food sectors, highlighting the chemical industry's unique raw material volatility that necessitates strong short-term liquidity buffers. The implication is that chemical managers should maintain a CR of approximately 1.44–2.0 to ensure uninterrupted production during price fluctuations, thereby reducing shutdown costs estimated at 5–10 percent of annual revenue.

TAT's positive and significant impact corroborates Ahmed & Siddiqui [8] DuPont framework, as well as the findings of Viona et al. [24] in basic chemical industries and Irman & Purwati [21] in automotive firms, which showed that higher turnover enhances ROA. Unlike Niresh & Velnampy [22] who reported mixed results in broader manufacturing sectors, the capital-intensive nature of chemical firms amplifies TAT's effect. Firms must optimize plant utilization above 80 percent of capacity and strengthen inventory turnover to convert fixed assets into revenue, targeting a TAT improvement of 0.2–0.5 points for ROA gains of 15–20 percent.

The positive SZ–ROA relationship supports the scale-advantage arguments of Dang et al. [18], Ho et al. [17], and Arifaj et al. [9], extending the evidence provided by Niresh & Velnampy [22] to chemical industry contexts. This is consistent with Fazria et al.'s [7] findings in Indonesia but contrasts with evidence from more flexible industries where smaller firms outperform due to agility. Large chemical firms should leverage scale for R&D investment at 2–3 percent of revenue and negotiate more favorable supplier terms, achieving cost savings of 10–15 percent, while smaller firms may pursue niche specialization strategies.

The negative and significant effect of DER confirms the capital structure trade-off theory, whereby excessive leverage increases interest burdens [16, 21, 23]. Chemical firms with high DER face heightened financial distress during commodity downturns because fixed debt obligations erode net income despite potential tax shields. The substantial DER variability in the sample (standard deviation 1.23) underscores the vulnerability of firms operating in high fixed-cost environments, where earnings volatility elevates default risks. This pattern is consistent across IDX industrial-sector studies and

emphasizes the need to maintain gearing below industry benchmarks.

WCTA's insignificant effect diverges from Kabir et al. [13] and may be attributable to suboptimal working capital management in chemical firms' extended supply chains. Unlike trading sectors, chemical production places greater emphasis on fixed assets than on current assets, reducing the influence of WCTA on profitability. Inefficiencies in receivables collection and inventory holding—common in industries that rely on raw material stockpiling—diminish liquidity's effect on ROA, particularly after log transformation. Managers should deprioritize WCTA optimization and instead focus on vendor financing and just-in-time inventory practices to minimize the drag associated with negative working capital.

5. Conclusions, Implications and Limitations

This study empirically confirms that among Indonesian chemical firms listed on the IDX (2019–2023), the Current Ratio (CR), Total Asset Turnover (TAT), and Firm Size (SZ) exert positive and significant effects on ROA, while the Debt to Equity Ratio (DER) demonstrates a significant negative effect. Working Capital to Total Assets (WCTA) remains insignificant. The fixed-effects model explains 74.2 percent of the variation in profitability (adjusted R^2 = 0.742), reflecting sector-specific dynamics in which liquidity buffers mitigate raw material volatility, asset efficiency counteracts capital intensity, scale advantages contribute to cost reductions, and excessive leverage heightens financial distress risks.

Limitations include 2019-2023 panel restricting post-pandemic insights, exclusion of 3 firms due to data gaps, and omission of external factors (commodity prices, ESG). Managerial recommendations include maintaining optimal CR to prevent production disruptions, targeting TAT improvements through >80% capacity utilization for 15-20% ROA gains, leveraging firm scale for 10-15% input cost reductions, and capping DER below 0.5 to safeguard margins amid commodity cycles. Investors should prioritize large-scale firms exhibiting efficient turnover and prudent leverage; policymakers could support asset optimization technologies to enhance sector competitiveness. These sector-specific insights fill a critical gap in understanding chemical industry profitability dynamics, with future research opportunities in post-2023 trends, nonlinear leverage effects, and subsector comparisons to broaden applicability.

Based on the findings of this study, several recommendations can be proposed for stakeholders in the chemical industry. For company management, improving liquidity management is essential, particularly by maintaining an optimal current ratio to ensure operational stability and the ability to meet short-term financial obligations. Firms should also enhance asset efficiency by optimizing asset utilization through process improvements and strategic investments. Maintaining a balanced capital structure is important, as a high Debt to Equity Ratio (DER) was found to negatively affect profitability. Additionally, larger firms should leverage their scale advantages, such as improved access to resources and economies of scale, to strengthen profitability.

For investors, the study highlights the importance of financial indicators such as the Current Ratio, Total Asset Turnover (TAT), and DER when evaluating investment opportunities in the chemical industry. Investors should be cautious when dealing with firms that have high DER, as this indicates increased financial risk. Firms with strong operational efficiency, reflected by higher TAT, are generally more attractive because of their ability to convert assets into revenue effectively.

For policymakers, the results underscore the need for supportive regulations and incentives that encourage efficient capital structures and sustainable financial practices, particularly for small and medium-sized enterprises in the chemical sector. Enhanced access to financial advisory services and education can help firms make better-informed decisions regarding debt management, liquidity, and investment planning. By adopting these recommendations, stakeholders can strengthen the financial resilience and competitiveness of Indonesia's chemical industry.

Limitations of the study include the 2019–2023 panel, which restricts insights into post-pandemic adjustments and potential structural shifts in the industry, the exclusion of three firms due to incomplete data that may reduce sample representativeness, and the omission of external variables such as commodity prices, exchange rate volatility, inflation, regulatory changes, and ESG factors, which limits the model's ability to capture broader macroeconomic and sustainability influences on profitability. The reliance on accounting-based indicators without incorporating market-based measures or operational efficiency metrics further narrows the analytical scope, while the focus on linear relationships leaves nonlinear dynamics, threshold effects, and potential endogeneity concerns unexplored. Future studies are encouraged to extend the time horizon to capture post-2023 developments, incorporate macroeconomic and sustainability variables, employ nonlinear or dynamic panel approaches such as threshold regression or GMM, and conduct subsector or cross-country comparisons to enhance generalizability

and deepen understanding of profitability drivers in the chemical industry.

Author Contributions: Conceptualization, M.K. and Z.M.; methodology, W.S.; software, K.F.; validation, T.C.D., K.F. and I.I.; formal analysis, M.K.; investigation, Z.M.; resources, Z.M.; data curation, K.F.; writing—original draft preparation, M.K.; writing—review and editing, Z.M.; visualization, I.I.; supervision, W.S.; project administration, M.K. All authors have read and agreed to the published version of the manuscript.

Funding: This study does not receive external funding.

Data Availability Statement: The data can be retrieved from the official IDX and company websites.

Acknowledgments: The authors would like to express their gratitude to their respective universities.

Conflicts of Interest: All the authors declare that there are no conflicts of interest.

References

1. Statistics Indonesia. (2023). *Quarterly Gross Domestic Product of Indonesia 2019-2023*, *Badan Pusat Statistik Indonesia*, BPS-Statistics Indonesia, Jakarta.
2. Statistics Indonesia. (2025). Perkembangan Indeks Produksi Industri Manufaktur 2024. https://www.bps.go.id/id/publication/2025/08/29/005f8f69b5b8216e792bacd9/perkembangan-indeks-produksi-industri-manufaktur-2024.html.
3. Ariadji, T., Yusgiantoro, L., Susanto, D., Sunarjanto, D., Sismartono, D., Akbar, W. A., Taher, W. P., and Arsegianto, A. (2018). Study of Gas Resources Utilization of Tangguh, Masela, and Kasuri Blocks for East Indonesia Regional Development, *Indonesian Journal of Energy*, Vol. 1, No. 1, 35–51. doi:10.33116/ije.v1i1.12.
4. BKPM. (2023). Investment Realization FDI & DDI Quarter IV and January – December 2022, 1-46.
5. Hamid, A. A. (2023). Impact of Liquidity and Solvency on Profitability- An Empirical Analysis of the Pharmaceuticals and Chemicals Sector of Bangladesh, *ICRRD Quality Index Research Journal*, Vol. 4, No. 1, 67–74. doi:10.53272/icrrd.v4i1.2.
6. Riono Putri, D., and Ichsanuddin Nur, D. (2023). Financial Distress Analysis with Firm Size as a Moderating Variable in the Restaurant, Hotel, and Tourism Sub-Sector Companies on the Stock Exchange of Indonesia, *JOURNAL OF ECONOMICS, Finance and Management Studies*, Vol. 06, No. 08, 3954–3964. doi:10.47191/jefms/v6-i8-45.
7. Fazria, R., Lubis, S. A., Fadilah, A. H., Afriliyani, I., Sembiring, D. J., and Sari, M. N. (2025). The Influence of Net Profit Margin and Company Size on Financial Performance in Product Sub-Sector Companies Registered Households on BEI 2021-2023, *International Journal of Economic Research and Financial Accounting (IJERFA)*, Vol. 3, No. 2, 367–373. doi:10.55227/ijerfa.v3i2.276.
8. Ahmed, A., and Siddiqui, D. A. (2019). Drivers of Profitability in Pakistan Stock Exchange (PSX) Through Du-Pont Equation, *SSRN Electronic Journal*, Vol. 10, No. 10, 137–151. doi:10.2139/ssrn.3384150.
9. Arifaj, A. H., Berisha, V., Morina, F., and Avdyli, E. (2023). Exploring the Impact of Cash Flow, Company Size, and Debt on Financial Performance in Corporations, *Investment Management and Financial Innovations*, Vol. 20, No. 3, 264–272. doi:10.21511/imfi.20(3).2023.22.
10. Jahan, N. (2014). Determinants of Profitability of Banks: Evidence from Islamic Banks of Bangladesh, *Bank Parikrama*, Vol. 39, No. 1, 136–149.
11. Krstić, B., Bonić, L., Rađenović, T., Jovanović Vujatović, M., and Ognjanović, J. (2023). Improving Profitability Measurement: Impact of Intellectual Capital Efficiency on Return on Total Employed Resources in Smart and Knowledge-Intensive Companies, *Sustainability*, Vol. 15, No. 15, 12076. doi:10.3390/su151512076.
12. Al-Nsour, O. J., and Al-Muhtadi, A. (2019). Capital Structure, Profitability and Firm's Value: Evidence from Jordan, *Research Journal of Finance and Accounting*, Vol. 10, No. 20, 73–80. doi:10.7176/RJFA/10-20-07.
13. Kabir, M. A., Lahlimi, A. E., Junaidu, A. M., Sham-Una, I., and Ahmad, M. (2020). WORKING CAPITAL RELATIONSHIP WITH FIRM PROFITABILITY AND SIZE, *International Journal of Economics, Business and Accounting Research (IJEBAR)*, Vol. 4, No. 03, 107–113. doi:10.29040/ijebar.v4i03.1134.
14. Panigrahi, A. K., and Joshi, V. (2019). Liquidity and Profitability Relationship and Financial Fallacy, *Think India Journal*, Vol. 22, No. 10, 704–718.
15. Utami, W. B. (2017). Analysis of Current Ratio Changes Effect, Asset Ratio Debt, Total Asset Turnover, Return On Asset, And Price Earning Ratio In Predictinggrowth Income By Considering Corporate Size In The Company Joined In LQ45 Index Year 2013 -2016, *International Journal of Economics, Business and Accounting Research (IJEBAR)*, Vol. 1, No. 01. doi:10.29040/ijebar.v1i01.253.
16. Abid, K., Zhang, D., Xiongyuan, W., and Aneela, I. I. (2024). Impact of Leverage on Firm Financial Performance: Evidence from Pakistan, *International Journal of Economics, Business and Management Research*, Vol. 08, No. 05, 63–80. doi:10.51505/IJEBMR.2024.8506.
17. Ho, F. N., Wang, H.-M. D., Ho-Dac, N., and Vitell, S. J. (2019). Nature and Relationship between Corporate Social Performance and Firm Size: A Cross-National Study, *Social Responsibility Journal*, Vol. 15, No. 2, 258–274. doi:10.1108/SRJ-02-2017-0025.
18. Dang, C., (Frank) Li, Z., and Yang, C. (2018). Measuring Firm Size in Empirical Corporate Finance, *Journal of Banking & Finance*, Vol. 86, No. 1, 159–176. doi:10.1016/j.jbankfin.2017.09.006.
19. Larasati, C. I., and Purwanto, P. (2022). How Financial Ratios and Firm Size Affect Profitability: Evidence from Food and Beverages Industry in Indonesia, *The Winners*, Vol. 23, No. 1, 43–50. doi:10.21512/tw.v23i1.7099.
20. Mahima Ima, U., Rabeta, M., Nahar, N., and Sharmin Sultana Sumi, M. (2024). Leverage-Induced Profitability in Bangladeshi Firms: An Empirical Analysis, *Investment Management and Financial Innovations*, Vol. 21, No. 1, 356–372. doi:10.21511/imfi.21(1).2024.27.
21. Irman, M., and Purwati, A. A. (2020). Analysis On The Influence Of Current Ratio, Debt to Equity Ratio and Total Asset Turnover Toward Return On Assets On The Otomotive and Component Company That Has Been Registered In Indonesia Stock Exchange Within 2011-2017, *International Journal of Economics Development Research (IJEDR)*, Vol. 1, No. 1, 36–44. doi:10.37385/ijedr.v1i1.26.
22. Niresh, J. A., and Velnampy, T. (2014). Firm Size and Profitability: A Study of Listed Manufacturing Firms Ed Manufacturing Firms in Sri Lanka, *International Journal of Business and Management*, Vol. 9, No. 4, 57–64. doi:10.5539/ijbm.v9n4p57.
23. Ayoush, M. D., A. Toumeh, A., and I. Shabaneh, K. (2021). Liquidity, Leverage, and Solvency: What Affects Profitability of Industrial Enterprises the Most?, *Investment Management and Financial Innovations*, Vol. 18, No. 3, 249–259. doi:10.21511/imfi.18(3).2021.22.
24. Viona, A., Syaula, M., and Ardian, N. (2025). Effect of Financial Ratios on Net Profit Growth in Manufacturing Companies in the Basic and Chemical Industry Subsectors Listed on the Indonesia

Stock Exchange, *International Journal of Management, Economic and Accounting*, Vol. 3, No. 1, 466–482.

25. Alade, T. A. (2024). Poor Working Capital Management Remain Major Cause of Business Failure, *International Journal of Research and Innovation in Social Science*, Vol. VIII, No. I, 1120–1124. doi:10.47772/IJRISS.2024.801081.

26. Kurniani, N. T. (2021). The Effect of Liquidity Ratio, Activity Ratio, and Profitability Ratio on Accounting Profit with Firm Size as a Mediation, *Journal of Economics and Business Letters*, Vol. 1, No. 3, 18–26. doi:10.55942/jebl.v1i3.122.

27. Wang, N., Wang, L., Zhang, L., and Yu, Y. (2021). Tax Shelters, Reputational Costs and CEO Turnover: Evidence from Tax-Violating Enterprises in China, *Emerging Markets Finance and Trade*, Vol. 57, No. 7, 1986–2005. doi:10.1080/1540496X.2020.1768070.

28. Ishak, K., and Selamat, M. I. (2024). Liquidity and Firm Market Value: The Moderating Role of Firm Size, *Shirkah: Journal of Economics and Business*, Vol. 10, No. 1, 62–77. doi:10.22515/shirkah.v10i1.755.

29. Hutabarat, M. I., Silalahi, H., Samosir, H. E. S., Siregar, M. R., and Damanik, H. M. (2023). Analysis Current Ratio, Return On Asset and Debt To Equity Ratio Nn Dividend Payout Ratio, *Enrichment: Journal of Management*, Vol. 13, No. 2, 1552–1559.

30. Creswell, J. W., and Creswell, J. D. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (3rd ed.), SAGE Publications, California.

31. Wooldridge, J. M. (2021). *Introductory Econometrics: A Modern Approach*, Cengage Learning.