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Financial Drivers of Profitability in Indonesia's Pharmaceutical Industry: A Panel Data Analysis

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Abstract: *This study delves into the factors that influence profitability in the Indonesian pharmaceutical business. Companies in this sector have distinct operational and financial obstacles as a result of protracted R&D cycles, high capital intensity, and strict regulatory requirements. A number of key profitability measures are impacted by the debt-to-asset ratio (DAR), inventory turnover (INTO), and total asset turnover (TOAS). This research intends to assess the impact of these variables on financial metrics such Asset Growth (AGRO), Cash Conversion Cycle (CCC), NPM, and ROA. Using a balanced panel dataset with 90 observations spanning 2014–2023, this study applies fixed and random effects panel regression models to the pharmaceutical industry in Indonesia. In order to account for unobserved heterogeneity and deliver reliable results, the study utilizes fixed and random effects panel regression models. The results show that increasing assets greatly improves profits, which is in line with the Resource-Based View theory's assertion that a company's unique assets are the most important factor in being competitive. Profitability is inversely related to debt-to-asset ratio, highlighting the need for careful debt management, and positively related to a flexible cash conversion cycle, indicating the advantages of flexible working capital techniques. Because of the unique operational complexity of the business, conventional efficiency measures such as inventory turnover and total asset turnover were determined to be less indicative of profitability. Managers, investors, and lawmakers in the pharmaceutical industry may benefit greatly from the findings, which highlight the importance of debt management and strategic asset investment in achieving profitability in a heavily regulated and capital-intensive industry.*

Keyword: *Profitability, Pharmaceutical Industry, Net Profit Margin, Return on Asset, Return on Equity, Asset Growth Cash Conversion Cycle, Debt to Asset, Debt to Equity, Total Asset.*

Abstrak: Studi ini mengkaji faktor-faktor yang memengaruhi profitabilitas dalam bisnis farmasi Indonesia. Perusahaan-perusahaan di sektor ini menghadapi berbagai kendala operasional dan keuangan akibat siklus litbang yang berlarut-larut, intensitas modal yang tinggi, dan persyaratan regulasi yang ketat. Sejumlah ukuran profitabilitas utama dipengaruhi oleh

rasio utang terhadap aset (DAR), perputaran persediaan (INTO), dan perputaran total aset (TOAS). Penelitian ini bertujuan untuk menilai dampak variabel-variabel tersebut terhadap metrik keuangan seperti Pertumbuhan Aset (AGRO), Siklus Konversi Kas (CCC), NPM, dan ROA. Dengan menggunakan dataset panel seimbang dengan 90 observasi yang mencakup periode 2014–2023, studi ini menerapkan model regresi panel efek tetap dan acak pada industri farmasi di Indonesia. Untuk memperhitungkan heterogenitas yang tidak teramati dan memberikan hasil yang andal, studi ini menggunakan model regresi panel efek tetap dan acak. Hasil penelitian menunjukkan bahwa peningkatan aset secara signifikan meningkatkan laba, yang sejalan dengan teori Resource-Based View yang menyatakan bahwa aset unik suatu perusahaan merupakan faktor terpenting dalam mencapai daya saing. Profitabilitas berbanding terbalik dengan rasio utang terhadap aset, yang menyoroti perlunya pengelolaan utang yang cermat, dan berbanding positif dengan siklus konversi kas yang fleksibel, yang menunjukkan keunggulan teknik modal kerja yang fleksibel. Karena kompleksitas operasional bisnis yang unik, ukuran efisiensi konvensional seperti perputaran persediaan dan perputaran total aset dianggap kurang menunjukkan profitabilitas. Para manajer, investor, dan pembuat undang-undang di industri farmasi dapat memperoleh manfaat besar dari temuan ini, yang menyoroti pentingnya pengelolaan utang dan investasi aset strategis dalam mencapai profitabilitas di industri yang sangat teregulasi dan padat modal.

Kata kunci: *Profitability, Pharmaceutical Industry, Net Profit Margin, Return on Asset, Return on Equity, Asset Growth Cash Conversion Cycle, Debt to Asset, Debt to Equity, Total Asset.*

INTRODUCTION

Given the capital-intensive nature of pharmaceutical operations and the vital role they play in public health, profitability metrics like Net Profit Margin (NPM) and Return on Assets (ROA) are highly valued in this industry for assessing financial stability and ensuring long-term sustainability (DiMasi et al., 2016). Maintaining profitability in this industry is made more difficult by the inherent complexity of drug development, such as lengthy research and development (R&D) cycles, significant initial investments, and strict regulatory requirements (Paul et al., 2010). Pharmaceutical firms have long cash conversion cycles and high R&D expenditures, which makes these financial metrics important for measuring success (Schuhmacher et al., 2016). This is in contrast to industries where profitability can be ramped up quickly. Research on the pharmaceutical industry's profit drivers has attracted the attention of both academics and those working within the field. Important financial metrics, such as the Debt-to-Asset Ratio (DAR), impact both the company's long-term strategy and its short-term profitability (Margaritis & Psillaki, 2010). Increasing resource availability through debt leveraging is possible, but taking on too much debt increases financial risk, particularly in regulatory contexts where income sources are vulnerable to patent expirations and policy changes (Myers, 2001). Measures of operational efficiency that provide light on asset usage include Inventory Turnover (INTO) and Total Asset Turnover (TOAS). The importance of these ratios may change in the pharmaceutical sector, though, because of the long product life cycles and rigorous quality standards that don't necessarily result in instant profits (Charitou et al., 2010; Subramaniam & Watson, 2016).

The Cash Conversion Cycle (CCC) also plays a critical role in shaping liquidity and operational flexibility (Jose et al., 1996). Although shorter CCCs typically benefit cash flow, extended credit terms and higher inventory levels may be strategic in the pharmaceutical industry to foster customer loyalty and ensure the availability of vital medications (Lazaridis & Tryfonidis, 2006). Aktas et al. (2015) contend that effective working capital management, including CCC optimization, can add value to a firm, highlighting the importance of strategic financial management in high-risk, capital-intensive sectors. Asset Growth (AGRO) is another

fundamental factor that influences profitability in the pharmaceutical industry. Capital-intensive sectors dependent on R&D rely on asset expansion to drive innovation and resource allocation (Hall & Lerner, 2010). Belenzon and Patacconi (2013) underscore that asset growth enables firms to attain economies of scale and better manage the high fixed costs tied to R&D. By enlarging their asset base, pharmaceutical firms can bolster R&D productivity, strengthen innovation capacity, and lower production expenses, thereby positively affecting profitability indicators such as NPM and ROA.

There is a dearth of empirical research that looks at how these financial metrics affect pharmaceutical sector profitability, even though they are clearly important. This is especially true in developing countries like Indonesia. Ameer (2015) states that financial limitations and increased loan costs are common challenges for enterprises in Asian nations. These factors impact investment decisions and overall profitability. The ability of pharmaceutical businesses in developing nations to invest in research and development and grow their operations is impacted by the alternative financing arrangements they may pursue due to limited access to financial markets. To address this gap, this research examines the factors that contribute to the financial success of Indonesian pharmaceutical firms. Using a balanced panel dataset of 90 observations from nine publicly listed companies between 2014 and 2023, it explores how factors like AGRO, CCC, DAR, INTO, and TOAS influence profitability indicators NPM and ROA. The study applies fixed- and random-effects panel regression models to account for unobserved heterogeneity across firms, offering robust insights into financial dynamics in this context (Field, 2013).By offering empirical evidence on the determinants of profitability in the Indonesian pharmaceutical industry, this study makes a valuable contribution to the literature, supplying practical implications for managers, investors, and policymakers. Recognizing how financial structure, asset stewardship, and operational efficiency impact profitability equips firms with strategic tools to bolster financial outcomes and uphold competitive strength in a highly regulated and complex landscape.

Additionally, this study underscores the necessity for greater transparency in financial reporting. Data availability and quality constraints—particularly the omission of essential variables by some firms—limit the robustness of analyses. Healy and Palepu (2001) pointed out that comprehensive, dependable financial data are vital for stakeholders making informed decisions. Regulatory agencies and industry groups should encourage standardized reporting procedures to bolster data comparability across different firms.By examining how asset growth, debt management, and working capital approaches interact with profitability, this research highlights key strategies that pharmaceutical companies can adopt to navigate financial risks and harness growth opportunities. In a sector known for substantial uncertainties yet commensurate rewards, strategic financial management remains pivotal for attaining sustained profitability and longevity.

The Purpose of the Study

The objectives of this study, derived from the problem formulation, are as follows:

1) To test and analyze the significance of Asset Growth (AGRO), the Cash Conversion Cycle (CCC), the Debt-to-Asset Ratio (DAR), Inventory Turnover (INTO), and Total Asset Turnover (TOAS) on the Net Profit Margin (NPM) of pharmaceutical companies in Indonesia.
2) To test and analyze the significance of Asset Growth (AGRO), the Cash Conversion Cycle (CCC), the Debt-to-Asset Ratio (DAR), Inventory Turnover (INTO), and Total Asset Turnover (TOAS) on the Return on Assets (ROA) of pharmaceutical companies in Indonesia.

METHODS

Framework for Study

This quantitative research calculates the effect of a number of key financial variables on two primary profitability metrics: Net Profit Margin (NPM) and Return on Assets (ROA). Asset Growth (AGRO), Cash Conversion Cycle (CCC), Debt-to-Asset Ratio (DAR), Inventory Turnover (INTO), and Total Asset Turnover (TOAS) are the parameters that are being discussed here. According to Gandhi and Porter (2009), this quantitative method offers a reproducible framework for assessing and understanding the interrelationships of the chosen variables. This study records the longitudinal and cross-sectional changes in a dataset that comprises nine pharmaceutical firms listed on the IDX from 2014 to 2023. Panel data models are used for this purpose.

Population and Sample

The population of this study comprises all pharmaceutical companies listed on the Indonesia Stock Exchange (IDX). The sample consists of nine pharmaceutical companies that were consistently listed and reported complete annual financial statements over the ten-year observation period, resulting in 90 firm-year observations. The sample was selected using purposive sampling based on data availability and completeness in the IDX database.

Data Sources and Sampling

The dataset consists of nine publicly listed pharmaceutical companies in Indonesia, observed across a ten-year interval, yielding 90 observations. Financial statements for these firms were sourced from the IDX database, ensuring consistent and reliable data regarding revenue, asset growth, cash conversion cycles, and other relevant financial variables. Focusing on IDX-listed companies also aligns with standardized disclosure requirements, enhancing the uniformity of the dataset (Healy & Palepu, 2001).

Definition of Variables and Measurement

Dependent Variables

1. Net Profit Margin (NPM): Calculated as net income divided by total revenue, capturing how effectively a company converts sales into net profit and reflecting cost efficiency and pricing strategy (Higgins, 2015).
2. Return on Assets (ROA): Computed by dividing net income by total assets, indicating how proficiently a firm employs its assets to generate earnings (Penman, 2013).

Independent Variables

1. Asset Growth (AGRO): Represents the annual increase in a firm's total assets, encompassing investments in research and development, infrastructure, and other growth-driven resources that are integral to competitive advantage in the pharmaceutical sector (Barney, 1991).
2. Cash Conversion Cycle (CCC): Reflects the duration between a firm's expenditure on inputs and the eventual collection of cash from sales. Although prolonged CCCs might suggest inefficiencies, they may also indicate strategic supplier and customer relationship management (Aktas, Croci, & Petmezas, 2015).
3. Debt-to-Asset Ratio (DAR): Calculated as total liabilities divided by total assets, showing the share of a company's assets financed through debt. Elevated DAR levels can restrict flexibility in capital-intensive industries like pharmaceuticals (Ameer, 2015).
4. Inventory Turnover (INTO): The frequency with which a company sells and replaces inventory over a given period, reflecting inventory management effectiveness (Gaur & Kesavan, 2015).
5. Total Asset Turnover (TOAS): How well a business converts its assets into cash is shown by the sales-to-assets ratio. Pharmaceutical businesses may have a decrease in

total assets sold (TOAS) due to patents and other intangible assets. Penman (2013) states that. a low total asset turnover is often caused by a high proportion of intangible assets that do not directly generate revenue, requiring companies to manage their assets strategically to improve overall asset utilization efficiency.

Data Analysis Techniques

The steps involved in the analysis are as follows:

1. **Descriptive Statistics**

   Descriptive statistics are used to present the characteristics of the data, including mean, median, minimum, maximum, skewness, kurtosis, and the Jarque-Bera test for normality (Gujarati & Porter, 2009).

2. **Panel Data Model Testing**

   Panel data analysis makes use of three different models: (CEM), (FEM), and (REM). The three tests used to determine the optimal model are the Chow, Hausman, and Breusch-Pagan analyses.

3. **Diagnostic Tests**

   The goals of checking the regression model for BLUE (Best Linear Unbiased Estimator) compliance are as follows:

   a. Normality Test (Jarque-Bera)
   b. Heteroskedasticity Test (Breusch-Pagan)
   c. Autocorrelation Test (Durbin-Watson)
   d. Multicollinearity Test (Correlation Matrix)

4. **Regression Analysis**

   Separate panel regression analyses are conducted to examine the effect of independent variables on each profitability metric (NPM and ROA). The overall model fit is evaluated using the F-statistic and R-squared, while the significance of each predictor is tested using the t-test, and the coefficients are interpreted in the context of the pharmaceutical industry.

RESULTS AND DISCUSSION

Descriptive Statistics

Tabel 1. Descriptive Statistics Results

Statistic	AGRO	CCC	DAR	INTO	TOAS	NPM	ROA
Mean	10.97	136.07	15.64	3.14	14.46	8.64	6.78
Median	5.80	128.90	4.71	3.14	14.51	7.77	6.20
Maximum	252.72	398.23	92.36	10.28	17.12	190.10	24.96
Minimum	-48.71	-203.99	0.00	0.00	0.00	-137.70	-31.62
Standard Deviation	32.18	99.55	20.05	1.64	2.55	26.92	7.26
Skewness	5.06	0.85	1.33	1.13	-4.04	1.57	-1.37
Kurtosis	37.25	3.72	4.21	6.46	23.77	33.65	10.83
Jarque-Bera	4,781.72	2.04	31.95	64.17	1,862.38	35,259.24	257.95
Probability	0.00	0.36	0.00	0.00	0.00	0.00	0.00
Number of Observations	90	90	90	90	90	90	90

Table 1 displays the descriptive statistics for the nine pharmaceutical companies listed on the Indonesia Stock Exchange (IDX) from 2014 to 2023. The table includes the following information for each financial variable: mean, maximum, minimum, standard deviation, and total number of observations (90 in all). The average asset growth (AGRO) is 10.97% with substantial variation. PT Pyridam Farma recorded the highest asset growth, while PT Indofarma

experienced negative asset growth. The average Cash Conversion Cycle (CCC) is 136.07 days, also with high variation, reflecting differences in working capital management. The average Debt to Asset Ratio (DAR) is relatively low, indicating a conservative financing policy, although PT Indofarma shows a high debt ratio. The average inventory turnover ratio (INTO) is 3.31 times per year, but some data are missing. The average total assets (TOAS) is 14.46, with some companies not reporting data.

The average Net Profit Margin (NPM) is 8.64%, but it varies significantly. PT Merck has the highest profitability, while PT Indofarma recorded substantial losses. The average Return on Assets (ROA) is 6.78%, with PT Sido Muncul achieving the highest ROA, while PT Indofarma again shows the lowest performance. Overall, there is considerable variability in the financial performance among companies, influenced by strategies, company size, and the completeness of financial reporting. Incomplete data reporting affects the accuracy of the analysis, highlighting the need for greater transparency.

Panel Data Model Testing

1. Specification Test Results for ROA

The model specification test (Hausman, 1978) on the first-differenced Return on Assets regression (D[ROA]) produced a $\chi^2(5)$ value of 4.87 with $p = 0.43$. Since the p-value is greater than $\alpha = 0.05$, the null hypothesis that firm-specific effects are uncorrelated with the explanatory variables cannot be rejected. This indicates that the random effects estimator remains consistent and asymptotically more efficient than the fixed effects estimator. Additionally, the software output shows that the variance across units is nearly zero, implying minimal residual heterogeneity after first differencing, which further reduces the efficiency advantage of using fixed effects. Therefore, the random effects model or even pooled OLS is considered appropriate for analyzing changes in ROA for the nine Indonesian pharmaceutical companies during 2015–2023.

2. Panel Data Test Results for NPM and ROA

The author also conducted several diagnostic tests to determine the appropriate panel data model for Net Profit Margin (NPM) and Return on Assets (ROA).

a. For NPM, the Chow test was significant ($p = 0.0152$), indicating that the fixed effects model is more appropriate than the common effects model. However, the Breusch Pagan test ($p = 0.3259$) did not support the random effects model, and the Hausman test was also not significant ($p = 0.569$). Based on standard decision rules (Gujarati & Porter, 2009), the author chose the fixed effects model for NPM.
b. For ROA, the Chow test was not significant ($p = 0.6705$), so the common effects model remains acceptable. The Breusch–Pagan test ($p = 0.3496$) and the Hausman test ($p = 0.4317$) also did not support the specification of random or fixed effects. Therefore, the common effects model is considered appropriate.

Diagnostic Tests

1. Normality Test

The Jarque–Bera (JB) test was conducted to assess whether the residuals (prediction errors) in the model are normally distributed—meaning they do not exhibit skewness and their kurtosis is neither excessively peaked nor flat. A significant residual for both NPM and a JB value ($p < 0.05$) is generated by ROA, according to the data. These findings disprove the hypothesis that residuals will have a normal distribution. Due to the lengthy research and development cycles, medicine patents, and government laws that affect the pharmaceutical business, financial data from this sector frequently follows this trend. However, there are exceptions to this rule. Here, the researcher verifies the validity of the regression results by manipulating the data or employing robust standard errors. No matter how non-normal the residuals are, the OLS will

continue to function. Assumptions like linearity, homoskedasticity, and variable exogeneity must also be satisfied for the model to be applicable. Regression models with non-normal residuals can still be viable for big samples according to the Central Limit Theorem.\

2. Heteroskedasticity Test

To find out how the residual variance varies between observations, the Breusch-Pagan LM test was used. We may accept the null hypothesis of homoskedasticity as all p-values in the NPM and ROA models are higher than 0.05. Since the residual variance remains constant, pooled OLS may be applied on the assumption that the errors are homogenous, hence avoiding the heteroskedasticity problem.

3. Autocorrelation Test

We used the Durbin-Watson (DW) test to see if the residuals were autocorrelated, or if they had serial correlation. In the absence of autocorrelation, an A DW value near 2 is indicative. Here are the test results:

a. NPM: DW = 2.40
b. ROA: DW = 2.04

Both values are close to 2, suggesting that there is no autocorrelation among residuals across periods. Thus, the regression model can be considered free from autocorrelation.

4. Multicollinearity Test

Multicollinearity occurs when independent variables overlap or are too similar, potentially destabilizing the analysis results. All of the Variance Inflation Factor (VIF) values for NPM are less than 5 (with a maximum of 2.34) and for ROA, all of the VIF values are less than 1.3, according to the results of the comparison. All VIF values are significantly below the generally accepted threshold of 10, suggesting that there is no substantial multicollinearity among the independent variables. Everything points to the fact that each variable contributes unique data, allowing the regression coefficients to be interpreted reliably.

CONCLUSION

Based on these findings, pharmaceutical companies may increase their profitability by increasing their asset base, since asset growth (AGRO) has a favorable and substantial effect on net profit margin (NPM) and return on assets (ROA). There is no noticeable effect on ROA from the Cash Conversion Cycle (CCC), although it does enhance NPM., while the Debt-to-Asset Ratio (DAR) shows a negative and significant impact on both profitability indicators, confirming that high debt levels can erode profit margins and asset returns. Meanwhile, Inventory Turnover (INTO) only has a positive effect on ROA, and Total Asset Turnover (TOAS) does not have a significant influence on either NPM or ROA.

These results imply that pharmaceutical firms in Indonesia should optimize asset growth, manage their cash cycles prudently, and exercise caution in leveraging debt to prevent adverse effects on profitability. For investors, AGRO and DAR can serve as key indicators for evaluating the prospects of a company's financial performance. Furthermore, government authorities and regulators are expected to promote transparency in financial reporting to support more accurate decision-making within the pharmaceutical sector.

Nevertheless, this study has several limitations that should be noted: the scope is restricted to the pharmaceutical industry in Indonesia, which means the findings may not be generalizable to other industries; the variables do not cover certain external factors such as market competition, government policies, or research and development (R&D) expenditures, all of which can also affect profitability; data limitations due to some companies not disclosing certain financial information, resulting in missing values in the analysis; and the study period of 2014–2023 could be extended to better capture long-term profitability trends.

Considering these findings and limitations, future research is expected to broaden the industrial and geographical scope, incorporate additional relevant variables, and use a longer observation period in order to provide a deeper comprehension of the variables impacting pharmaceutical industry profitability and beyond.

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