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Determinants of Intrinsic Value in Plantation Companies: An Analysis of Palm Oil Productivity, Firm Size, and Financial Performance on Indonesia Stock Exchange

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Abstract

The palm oil industry is a cornerstone of Indonesia's economy, contributing significantly to GDP, exports, and employment. As the largest global palm oil producer, Indonesia supports a vast international market but faces challenges related to productivity and sustainability. This study investigates the influence of productivity, firm size, profitability, liquidity, and leverage on the intrinsic value of plantation companies listed on the Indonesia Stock Exchange (IDX) from 2018–2022. Employing a quantitative methodology, panel data regression analysis was applied to a sample of 14 companies, selected through purposive sampling, representing a focused yet representative subset of the population. Intrinsic value was calculated using the Free Cash Flow to Firm (FCFF) model

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under the Discounted Cash Flow (DCF) approach. The findings reveal that firm size significantly enhances intrinsic value, indicating that larger firms benefit from economies of scale and better access to financing. However, productivity, profitability, liquidity, and leverage, while positively correlated, show statistically insignificant effects, suggesting that external factors such as global commodity price volatility and inefficiencies in financial management may play a role. This study underscores the critical role of firm size in driving intrinsic value while calling for further exploration of external factors impacting the palm oil sector. The results offer valuable insights for investors and policymakers in fostering financial performance and sustainable industry growth.

Keywords: *Palm oil industry, intrinsic value, firm size, productivity, financial performance*

1. Introduction

The palm oil industry in Indonesia is a vital economic pillar, contributing to national income growth, exports, and employment generation. As the world's largest palm oil producer, Indonesia plays a significant role in the global market. In 2022, the industry accounted for approximately 3.5% of Indonesia's Gross Domestic Product (GDP) with a cultivated area of 16.3 million hectares (Ministry of Agriculture of Indonesia, 2022; Statistics Indonesia, 2022). Despite the economic opportunities offered by this sector, it faces ongoing challenges in productivity efficiency and environmental sustainability (Djaja, 2017; Sipayung, 2023).

The global demand for palm oil, especially from regions like Southeast Asia, China, and India (ACI), has made investments in this sector particularly attractive. In 2022, palm oil consumption in the ACI region reached 51.2 million tons, with projections indicating continued growth due to rising population levels and increased demand for bio-based energy (PASPI, 2023). However, the financial performance of palm oil plantation companies often fluctuates significantly, influenced by external factors such as global commodity prices and government policies (Agung & Susilawati, 2021; Sipayung, 2023).

Intrinsic value, representing the fundamental worth of a company based on detailed analysis of cash flows, risk factors, and growth projections, is a key consideration in investment decisions (Damodaran, 2011). The Free Cash Flow to Firm (FCFF) model under the Discounted Cash Flow (DCF) approach is a widely used metric to measure intrinsic value. Positive FCFF indicates strong financial health, while negative FCFF suggests financial distress (Nivanna & Natalylova, 2022; Nguyen et al., 2016). Studies on plantation companies such as AALI, SIMP, SMAR, UNSP, and BWPT show that FCFF is influenced by factors such as productivity, firm size, profitability, liquidity, and leverage (Djaja, 2017; Sujarweni, 2021).

Productivity in the palm oil industry is pivotal, given its superior output of 3.36 tons of crude palm oil (CPO) per hectare compared to alternative oil crops such as soybeans and sunflower (Sipayung, 2023b). However, prior research presents mixed findings regarding the impact of productivity on firm value. Sunardi (2020) and Lumapow & Tumiwa (2017) found positive effects, while Nurisnaini et al. (2023) observed negative and insignificant impacts.

Similarly, firm size, often associated with financial stability and easier access to funding, has been shown to influence intrinsic value (Darmawan et al., 2020; Jamaluddin Majid, 2017). Yet, findings from companies such as SMAR and BWPT suggest that larger size does not always guarantee positive FCFF, in line with studies reporting conflicting results (Mujino & Wijaya, 2021; Tabe et al., 2022).

Profitability, a measure of a firm's ability to generate earnings, is another critical determinant. High profitability, often represented by Return on Assets (ROA), has been linked to increased firm value (Butar-Butar et al., 2021; Laksmi Dewi & Dharma Suputra, 2019). However, Rahmatullah (2019) reported that profitability does not significantly affect firm value.

Liquidity, measured through quick ratio, reflects a company's capacity to meet short-term obligations. While high liquidity is generally favorable for investors, inconsistencies have been observed, as companies like AALI and BWPT often show high liquidity with negative FCFF (Mulyadi & Mulyadi, 2022; Fajaria, 2018).

Leverage, indicating a firm's reliance on debt, can enhance returns but also increases financial risk. Prior studies present mixed evidence on its impact, with some showing positive but insignificant effects (Fahriyal et al., 2020; Zhang & Zhou, 2020).

This study seeks to bridge the research gap by analyzing the impact of productivity, firm size, profitability, liquidity, and leverage on the intrinsic value of palm oil plantation companies listed on the Indonesia Stock Exchange.

2. Method

This study employs a quantitative research design, focusing on the collection and analysis of numerical data using statistical techniques. The research adopts a causal approach, aiming to examine the cause-and-effect relationships between independent variables (palm oil productivity, firm size, profitability, liquidity, and leverage) and the dependent variable (intrinsic value) (Fachrudin & Meliza, 2014). The research follows a deductive process, applying logical reasoning from theoretical frameworks to hypothesis testing (Sinulingga, 2013).

Research Setting and Duration

The research focuses on plantation companies listed on the Indonesia Stock Exchange (IDX) during the period of 2018–2022. Data were sourced from the official IDX website (www.idx.co.id) and related repositories. The IDX website was chosen as the primary data source because it is the official platform providing accurate and comprehensive financial reports, corporate disclosures, and historical data for publicly listed companies in Indonesia. This ensures the reliability, validity, and authenticity of the data used in the study. Additionally, the IDX database is frequently updated and adheres to strict regulatory requirements, making it a trusted source for financial research. The study was conducted between May and June 2024.

Operational Definitions and Measurement Scales

The operational definitions and measurement indicators for each variable are summarized in the following table:

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Table 1. Operational Definitions and Measurement Scales

Variable	Operational Definition	Indicator	Scale
Intrinsic Value (Y)	The true value of a firm, calculated using future free cash flows through the Discounted Cash Flow (DCF) approach (Djaja, 2017).	Firm Value= $\sum(\frac{CF_n}{(1+WACC)^n}) + \frac{TV_t}{WACC-g}$	Ratio
Palm Oil Productivity (X1)	The annual crude palm oil (CPO) production per hectare of productive land (Bruno, 2017).	Productivity = $\frac{\text{Annual CPO Production}}{\text{Productive Land Area}}$	Ratio
Firm Size (X2)	The size of the company, measured through total assets, sales, or market capitalization (Jamaluddin Majid, 2017).	Ln (Total Assets)	Ratio
Profitability (X3)	The company's ability to generate profits relative to total assets (Kasmir, 2019).	ROA= $\frac{\text{Net Income}}{\text{Total Assets}}$ ×100%	Ratio
Liquidity (X4)	The company's ability to meet short-term obligations using the most liquid assets (Sujarweni, 2021).	Quick Ratio = $\frac{Current\ Assets - Inventory}{\text{Current Liabilities}}$	Ratio

Leverage (X5)	The ratio of total liabilities to equity, indicating the company's reliance on debt (Sujarweni, 2021).	DER= $\frac{Total\ Debt}{\text{Total Equity}}$	Ratio

Population and Sample

The population of this study consists of 24 plantation companies listed on the IDX from 2018–2022. A purposive sampling method was used, applying the following criteria:

1. Companies listed on the IDX as of 2018.
2. Companies with complete financial statements for 2018–2022.
3. Companies with available data for all variables under investigation.

Following this selection process, 14 companies met the criteria, yielding 70 observations (14 companies over 5 years). The timeline of 2018–2022 was chosen to ensure that the data reflects recent financial and operational performance while maintaining relevance to the current economic environment. This period also encompasses significant global and domestic events, such as commodity price fluctuations and the COVID-19 pandemic, which have had notable impacts on the palm oil industry. By focusing on this timeline, the study captures the industry's resilience and adaptation to these challenges, providing insights into contemporary trends and practices. Furthermore, the availability and consistency of financial data within this timeframe allow for a robust analysis.

Table 2. Sample Selection Process

Criteria	Count
Plantation companies listed on the IDX	24
Excluded: Not listed in 2018	-6
Excluded: Incomplete financial statements	-3
Excluded: Missing variable data	-1
Final Sample	14

Data Types and Sources

This study utilizes secondary data obtained from:

- Annual financial reports published on the IDX official website (www.idx.co.id).
- Scholarly journals, textbooks, and publications related to research theories and methodologies.

Data Collection Method

Data were collected through documentary analysis, which involved:

1. Accessing company financial statements from the IDX official website.
2. Reviewing relevant academic journals and literature related to the research variables.
3. Compiling numerical data required for hypothesis testing.

Data Analysis Techniques

Calculation of Intrinsic Value

The intrinsic value of each company was determined using the Discounted Cash Flow (DCF) approach, which includes the following steps:

1. Projection of Financial Performance: Free Cash Flow to Firm (FCFF) was calculated using the formula:

$$FCFF=EBIT\ (1-Tax\ Rate) + Depreciation - Capital\ Expenditure - Change\ in\ Working\ Capital$$

2. Discount Rate Determination: The discount rate was calculated using the Weighted Average Cost of Capital (WACC) and the Capital Asset Pricing Model (CAPM):

$$WACC = Ke\ (E/V) + Kps\ (P/V) + Kd\ (1-t)(D/V$$

3. Terminal Value Calculation: The Gordon Growth Model was used to calculate the terminal value:

$$TV_t = \frac{FCF_t\,(1+g)}{Ke-g}$$

4. Firm Value Calculation: The firm value was computed as:

$$\textit{Firm Value} = \sum_{n=i}^{t} \frac{CF_n}{(1+WACC)^n} + \frac{TV_t}{WACC-g}$$

Panel Data Regression Model

The study employed panel data regression analysis to examine the relationships between independent variables and intrinsic value. The regression equation is as follows:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Y: Intrinsic Value of the company, derived using the Discounted Cash Flow (DCF) method.
aaa: Intercept, representing the constant term in the regression equation.
β1,β2,β3,β4,β5: Coefficients for the independent variables, representing their respective impacts on intrinsic value.
X_1: Palm Oil Productivity, measured as the annual crude palm oil (CPO) production per hectare of productive land.
X_2: Firm Size, determined using the natural logarithm of total assets.
X_3: Profitability, measured by Return on Assets (ROA), which calculates net income relative to total assets.
X_4: Liquidity, assessed through the Quick Ratio, which measures a company's ability to cover short-term liabilities with its most liquid assets.
X_5: Leverage, calculated using the Debt-to-Equity Ratio (DER), indicating the extent of a company's debt relative to its equity.
ε\varepsilonε: Error term, accounting for unexplained variability in the regression model.

Model Validation

To ensure the reliability and validity of the regression model, the following steps were undertaken:

1. Model selection to identify the best-fit panel data regression model.
2. Classical assumption tests, including multicollinearity, heteroscedasticity, and autocorrelation.
   Hypothesis testing to evaluate the significance of the independent variables

3. Result And Discussion

3.1 Result

This study was conducted on 14 plantation companies listed on the Indonesia Stock Exchange (IDX) during the 2018–2022 period. The sample was selected based on the completeness of financial reports and the availability of data related to research variables. The list of companies included as research samples is as follows:

Table 3. listed companies and stock code

No	Company Name	Stock Code
1	PT Astra Agro Lestari Tbk	AALI
2	PT Andira Agro Tbk	ANDI
3	PT Austindo Nusantara Jaya Tbk	ANJT
4	PT Eagle High Plantations Tbk	BWPT
5	PT Dharma Satya Nusantara Tbk	DSNG
6	PT Gozco Plantations Tbk	GZCO
7	PT PP London Sumatra Indonesia Tbk	LSIP
8	PT Sampoerna Agro Tbk	SGRO

9	PT Salim Ivomas Pratama Tbk	SIMP
10	PT Smart Tbk	SMAR
11	PT Sawit Sumbermas Sarana Tbk	SSMS
12	PT Tunas Baru Lampung Tbk	TBLA
13	PT Bakrie Sumatera Plantations Tbk	UNSP
14	PT Jaya Agra Wattie Tbk	JAWA

Data Analysis

Descriptive Statistics

Descriptive statistical analysis was performed to provide an overview of the research variables, including palm oil productivity, firm size, profitability, liquidity, leverage, and intrinsic value. The results of the descriptive analysis are presented in the following table:

Table 4. Descriptive analysis results

Variable	Minimum	Maximum	Mean	Standard Deviation
Palm Oil Productivity (X1)	0.94	8.33	4.62	1.71
Firm Size (X2)	13.00	17.57	16.06	1.13
Profitability (X3)	-58.25	20.49	0.10	10.26
Liquidity (X4)	0.04	6.28	1.33	1.35
Leverage (X5)	-10.31	29.32	29.31	4.48
Intrinsic Value (Y)	-1.17	3.59	7.81	8.36

Model Selection for Panel Data Regression

Based on model feasibility testing, the Random Effects Model (REM) was determined to be the most suitable approach for this study. The results of the model selection tests are as follows:

Table 5. Random Effect Model Criteria

Test	Result	Decision
Chow Test	Prob = 0.000 (<0.05)	Fixed Effects Model
Hausman Test	Prob = 0.1435 (>0.05)	Random Effects Model
LM Test	Prob = 0.000 (<0.05)	Random Effects Model

The Random Effects Model (REM) was selected as the best-fit model based on these results.

Panel Data Regression Analysis

The results of the panel data regression analysis using the Random Effects Model (REM) are presented in the table below:

Table 6. Regression analysis results

Independent Variable	Coefficient	t-Statistic	Probability
Palm Oil Productivity (X1)	6.61	1.81	0.0724
Firm Size (X2)	28.40	3.05	0.0042
Profitability (X3)	0.30	0.88	0.3846
Liquidity (X4)	0.10	0.02	0.9810
Leverage (X5)	0.31	0.28	0.7804
Constant	-416.00	-	-

The regression equation derived from the analysis is:

$$Y = -416 + 6{,}61X_1 + 28{,}4X_2 + 0{,}304X_3 + 0{,}105X_4 + 0{,}308X_5$$

Interpretation of Coefficients:

1. **Palm Oil Productivity (X1):** Has a positive but not significant effect on intrinsic value.
2. **Firm Size (X2):** Has a positive and significant effect on intrinsic value.
3. **Profitability (X3), Liquidity (X4), and Leverage (X5):** Have positive but not significant effects on intrinsic value.

Model Fit (Goodness of Fit)

The **R-squared value** indicates that 8.77% of the variation in intrinsic value is explained by the independent variables in the model, while the remaining variation is attributable to factors outside the model.

Hypothesis Testing (t-Test)

The t-test results for individual variables are summarized below:

Table 7. Hypothesis results test

Variable	Conclusion
Palm Oil Productivity (X1)	Positive, but not significant.
Firm Size (X2)	Positive and significant.
Profitability (X3)	Positive, but not significant.
Liquidity (X4)	Positive, but not significant.
Leverage (X5)	Positive, but not significant.

Hypothesis Testing (F-Test)

The results of the F-test indicate a probability value of 0.0607 (≥ 0.05), suggesting that the independent variables—palm oil productivity, firm size, profitability, liquidity, and leverage—collectively do not have a statistically significant effect on intrinsic value at the 5% significance level. While this outcome implies that the model as a whole lacks strong predictive power for intrinsic value, it highlights the potential influence of external factors not included in the analysis. These external variables, such as global commodity prices, regulatory policies, and macroeconomic conditions, may play a more critical role in determining the intrinsic value of plantation companies.

3.2 Discussion

Effect of Palm Oil Productivity on Intrinsic Value

The results indicate that palm oil productivity (X1) has a positive but not significant effect on intrinsic value, with a probability of 0.0724. Palm oil productivity reflects the efficiency of land use in producing palm oil, which is influenced by factors such as cultivation techniques, climate, and crop maintenance. High productivity should ideally provide an economic advantage by reducing production costs per unit and increasing profitability.

However, the lack of significance may be attributed to external factors such as fluctuations in global commodity prices, government regulations on exports, and high operational costs that reduce profit margins. Additionally, inefficiencies in the supply chain can also affect the contribution of productivity to intrinsic value. These findings are consistent with research by Sunardi (2020) and Lumapow & Tumiwa (2017), which found that productivity has a positive but not significant effect on firm value. However, this result differs from Nurisnaini et al. (2023), who reported that productivity has a negative effect on firm value.

Effect of Firm Size on Intrinsic Value

The test results show that firm size (X2) has a positive and significant effect on intrinsic value, with a probability of 0.0042 (<0.05). Companies with larger assets tend to have easier access to both internal and external funding, as well as a strong reputation that

enhances investor and customer confidence. Better bargaining power in negotiations with suppliers also provides a competitive advantage by reducing costs and increasing profits. This finding is consistent with studies by Darmawan et al. (2020), Panggabean et al. (2021), and Arifin & Silviana (2016), which stated that firm size positively and significantly affects firm value. However, this result differs from research by Dharmaputra et al. (2022), which found that firm size has a negative effect on firm value. This suggests that, in the context of the plantation industry, economies of scale are a key driver of intrinsic value growth.

Effect of Profitability on Intrinsic Value

Profitability (X3) shows a positive but not significant effect on intrinsic value, with a probability of 0.3846. Profitability is measured by return on assets (ROA), which reflects a company's ability to generate profits from its assets. However, the low significance may be explained by large investment allocations in research and development or expansion, which increase operational costs in the short term.

The COVID-19 pandemic during the research period also contributed to profitability instability in the plantation sector. This finding aligns with studies by Nurisnaini et al. (2023) and Sudiyatno et al. (2021), which found that profitability has a positive but not significant effect on firm value. Conversely, studies by Butar-Butar et al. (2021) and Laksmi Dewi & Suputra (2019) reported that profitability has a significant positive effect on firm value, particularly for companies with low leverage levels.

Effect of Liquidity on Intrinsic Value

Liquidity (X4) has a positive but not significant effect on intrinsic value, with a probability of 0.9810. Liquidity reflects a company's ability to meet its short-term obligations. However, these results suggest that a high liquidity ratio does not always lead to an increase in intrinsic value, particularly if current assets are not optimally utilized for productive investment opportunities.

This finding supports studies by Irawati et al. (2022) and Putri (2020), which found that liquidity has a positive but not significant effect on firm value. On the other hand, it contradicts research by Arifin & Agustami (2017), which stated that liquidity has a significant effect on firm value. This indicates that, in the context of the plantation industry, liquidity management is not a primary indicator considered by investors.

Effect of Leverage on Intrinsic Value

Leverage (X5) also shows a positive but not significant effect on intrinsic value, with a probability of 0.7804. Leverage reflects a company's funding strategy through debt to support operational and investment activities. While leverage can enhance shareholder returns if managed well, the financial risk from high debt levels can also reduce investor confidence.

This finding is consistent with studies by Anggara et al. (2021) and Nurmalitasari & Durya (2022), which found that leverage has a positive but not significant effect on firm value. However, it contradicts research by Putri (2020), which stated that leverage has a significant negative effect. The lack of significance in this study may be related to suboptimal debt risk management in plantation companies

4. Conclusion and Recommendation

This study emphasizes the importance of considering more comprehensive external factors in analyzing intrinsic value, especially in sectors heavily influenced by global market conditions, such as the palm oil industry. Based on the analysis of the influence of palm oil productivity, firm size, profitability, liquidity, and leverage on the intrinsic value of plantation companies listed on the Indonesia Stock Exchange for the 2018–2022 period, it can be concluded that palm oil productivity, profitability, liquidity, and leverage each have a positive but not significant effect on intrinsic value. Meanwhile, firm size has a positive and significant effect on intrinsic value, indicating that larger companies are better positioned to enhance their value through improved access to funding, operational efficiency, and a strong reputation. Collectively, the five independent variables do not have a significant effect on intrinsic value, with an R-squared value of 8.77%,

meaning that most of the variation in intrinsic value is explained by factors outside the scope of this study. These results highlight the importance of external aspects, such as global market conditions, commodity prices, government policies, and supply chain efficiency, in influencing the intrinsic value of companies.

For company management, companies should enhance operational efficiency through innovation and better resource management to maximize the impact of productivity on firm value. Larger companies should leverage their assets more strategically to increase competitiveness and make a more significant contribution to intrinsic value. Maintaining profitability through prudent cost and investment management is essential to attract investors.

For future researchers, future studies should include external factors such as global palm oil prices, regulatory policies, and macroeconomic conditions to provide more comprehensive analytical results. Employing qualitative methods to explore additional factors influencing intrinsic value can offer deeper insights into company valuation.

For policymakers and regulators, implementing policies that support the stability of commodity prices to reduce market volatility is crucial. Encouraging healthy debt management practices among companies in the plantation sector can also help improve firm value.

Limitations of the Study

This study has several limitations that should be considered. First, the sample size is relatively small, focusing on 14 plantation companies listed on the Indonesia Stock Exchange (IDX) from 2018–2022. This limited sample, selected based on strict inclusion criteria, may not fully represent the broader plantation sector. Additionally, the timeframe of the study is relatively short, potentially overlooking long-term trends and events that could influence the intrinsic value of companies, such as global economic cycles or industry-specific developments.

Moreover, while the study examines internal factors such as productivity, firm size, profitability, liquidity, and leverage, it does not quantitatively address external influences like global commodity prices, regulatory changes, or macroeconomic conditions. These external factors are likely to play a significant role in shaping the financial performance and intrinsic value of plantation companies. Future research should expand the sample size, extend the analysis period, and include external variables to provide a more comprehensive understanding of the determinants of intrinsic value in the palm oil industry

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