Research Article

Best Value Investing Strategy: Analysis of Graham, Greenblatt, and Piotroski Methods for Smart Investment Decisions

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Abstract

This study aims to analyze the value investment portfolio strategy based on prominent investors Benjamin Graham, Joel Greenblatt and Joseph Piotroski. The three portfolio models are built according to the methodology developed by each author, using the last five years of financial accounting data and through stocks listed on the Kompas 100 Index listed on the Indonesia Stock Exchange for the 2022 period. This study uses a three-factor model from the Fama and French method which is an extension of the Capital Asset Pricing Model methodology by adding Small Minus Big and High Minus Low. The regression results show that all three strategies produce positive and statistically significant coefficients in the three-factor model setting. After backtesting the three portfolios, Graham's portfolio has a higher return compared to the other two portfolios. The managerial implications of this study include the implementation of strategies based on strengthening financial fundamentals and operational efficiency to increase the company's attractiveness in the eyes of value-investing investors.

Keywords: Three Factor Model, Value Investing, Fama and French, Investment Portfolio.

1. Introduction

The study focuses on stocks listed on the Kompas 100 Index, and three portfolio models are screened as part of the study. The choice of the Kompas 100 Index is deliberate as it encompasses 100 stocks of companies with the highest market capitalization and liquidity on the Indonesia Stock Exchange. This index is considered a reliable gauge of the overall performance of the Indonesian stock market, as it spans various industrial sectors (Santosa et al., 2020). We utilizing the stocks within this index, the study aims to provide a more precise overview of the growth trend and stock performance over the past 5 years (2018-2022). Moreover, the Kompas 100 Index serves as a key benchmark for investors to assess market vitality. Consequently, the findings of this study hold relevance for investors in their decision-making processes.

The Kompas 100 Index comprises 100 stocks with high liquidity, market capitalization, strong fundamentals, and solid company performance. These stocks are key drivers of the Composite Stock Price Index, as they are chosen based on transaction value, frequency, and market capitalization (Serolin, 2023). Over the last decade, the Kompas 100 Index has shown a return performance of 49.69%, reflecting a significant increase in investment value driven by the price movement of these 100 stocks.

Portfolio theory is an investment approach in which investors assess expected returns and risks and then use statistical measures to construct a portfolio (Pan and Long, 2021). According to Eom and Park (2018) and (Sihombing et al., 2024a), an efficient portfolio emphasizes equalizing the weights of stock investments rather than increasing the number of stocks. Investors are increasingly refining modern portfolio strategies to create an optimal portfolio over time. Constructing a strong investment portfolio involves evaluating the risk and return of each available asset. Growth investing evaluations, typically rely on long-term sales estimates and generated cash flows.

We reviewed the studies to understand their methodologies for evaluating portfolio performance. Each study offers valuable insights into different approaches for evaluating portfolio performance, including quantitative and qualitative analyses. Benjamin's study emphasizes the use of modern portfolio theory and risk-adjusted performance measures, while Joel's research focuses on factor-based models for performance evaluation. Joseph's study delves into behavioral finance aspects and their impact on portfolio performance assessment. Showed that the analysis strategy applied is a simple accounting-based fundamental strategy. When applied to a portfolio of companies with high book-to-market, it can shift the distribution of returns obtained by investors. This study is based on the analysis of financial statements concentrated on small and medium-sized companies and companies with low stock turnover, Domingues et al., (2022) based on the three-methodology approach developed by Piotroski, Graham and Greenblatt in 2006 - 2019; it resulted that the Graham, Greenblatt and Piotroski Portfolios generated returns of 36.14%, 21.92% and 30.06%, respectively, exceeding the annual return of Ibovespa, which was only 9.26% in the same period. The F-Score applied by Piotroski provided a more optimal profit of 20.66% for companies listed on the Vietnam stock exchange.

This study faces a gap related to the less comprehensive understanding of how debt policy, profitability, and dividend policy affect firm value, especially in the context of non-financial companies listed in Indonesia. (Sihombing et al., 2024b) previous studies only analyzed the impact of each variable individually, and few explored in depth how dividend policy can act as a moderating variable in the relationship between financial ratios and firm value.

This study provides a new contribution by analyzing the latest data from non-financial companies listed on the Indonesia Stock Exchange during the period 2017-2021. It also explores in more depth the role of dividend policy as a moderating variable, which has not been widely discussed in previous studies. Thus, this study not only provides new insights into the relationship between firm size, debt policy, profitability, and firm value but also emphasizes the important role of dividend policy in moderating this relationship.

2. Literature Review and Hypothesis
Literature Review
Benjamin Graham Strategy
Are the authors of the book The Intelligent Investor, which is Value Investment; they are known as the fathers of strategy and mentors of Warren Buffett, his famous and successful student to this day. According to Graham, a very clear investment is an investment made after a thorough analysis of a company and its underlying business health, promising the value of the principal security to avoid serious losses and expecting adequate, not extraordinary, returns. Explain a brief guide to help investors with their investment strategies, guiding against areas of substantial

error and aiming for satisfactory returns in the long term by suggesting the application of the methods to find companies with strong balance sheets, profitable and undervalued.

Joel Greenblatt's Strategy

Received attention when Greenblatt presented the so-called Magic Formula, a name associated with his strategy for stock selection. His investment strategy, based on value investing, focuses on buying above-average (highly profitable) companies at below-average (cheap) prices. To achieve this, Joel Greenblatt ranks companies based on two indicators: Return on Invested Capital and Enterprise Value to EBIT. He creates two rankings where each company receives a position based on its respective indicator, with 1 being the best and so on. According to the author, his investment strategy offers higher returns than those offered by the S&P 500 index in at least 96% of the periods. As a manager at Gotham Capital-an American Investment Firm-Greenblatt achieved an average annual return of 40% between 1985 and 2006.

Joseph Piotroski's Strategy

Simple accounting-based fundamental analysis strategy applied to a portfolio of companies with a higher book-to-market ratio can shift the distribution of returns and create the F-Score method that investors often use. The goal of Piotroski's strategy is to show how investors can create a stronger value portfolio using a screen based on historical financial performance. If successful, this strategy will change the way investors divide value. The method used is easy to interpret and apply and has broad appeal as a summary performance statistic.

Small and medium-sized companies (SMB)

Fama and French (2019) expanded the CAPM model by adding a three-factor model, one of which is small minus big (SMB). SMB tries to explain the return of a stock portfolio by considering the company's market capitalization. Small and medium-sized companies (SMB) specifically measure the difference between a portfolio of large and small company stocks. If the SMB portfolio is positive, it indicates that large company stocks grow better than small company stocks. If the SMB portfolio is negative, it indicates that large company stocks outperform small company stocks. Using its mathematical formula, SMB can be calculated by taking the average stock return of small companies and subtracting it from the average stock return of large companies.

High Minus Low (HML)

The HML (High Minus Low) theory is one of the key aspects of the Fama-French (2019) three-factor model. This model extends the traditional financial asset pricing model that only considers market risk by including two additional factors: SMB (Small Minus Big) and HML (High Minus Low). HML refers to the difference between a stock portfolio with high book-to-market ratio characteristics and a stock portfolio with low book-to-market ratio characteristics. The book-to-market ratio itself is calculated as the ratio of a company's book value to its stock market value. When compared to a portfolio with a low book value, a portfolio with a high book value tends to generate higher returns. Therefore, HML provides a basis for understanding differences in stock performance based on the company's value characteristics. Essentially, stocks with higher value characteristics generate higher returns than can be explained by market risk alone.

Risk-Adjusted Return (RAR)

Investment portfolio management, a concept known as Risk-Adjusted Return, measures the return generated from an investment compared to the level of risk of the portfolio. Risk-adjusted return helps investors determine whether an investment provides sufficient returns for the risk taken. The Sharpe ratio and Treynor ratio are some of the ratios to measure and improve portfolio performance in measuring the risk accepted Atmaca, (2022). The Sharpe ratio model and the Treynor ratio are some of the methods commonly used to calculate Risk-Adjusted Return. Excess returns depend on the loading and loading of risk, one of which is the Capital

Asset Pricing Model approach Ayub et al., (2020) William F Sharpe (2017). States that the concept of the beta model shows that the beta of an asset can be influenced by market risk and company-specific risk.

Accrue Return
Accrue return or access return emphasizes the importance of utilizing investment returns efficiently to increase portfolio value (Sharpe, 2017). This result includes the accumulation of interest from interest-bearing instruments, dividends from stocks, and capital gains from the sale of assets. With a focus on long-term growth, this concept recognizes that investment returns are used to reinvest the proceeds of investments. Bodie & Marcus (2018). When income, such as interest, dividends, or capital gains, is received from an investment and then reinvested rather than withdrawn, the proceeds can grow over time. This growth creates additional income or profits, which can then be reinvested, forming a positive cycle that generates accumulated returns, thus driving exponential growth.

Hypothesis
The Effect of Excess Return on Portfolio Return Performance
The effect of excess return on a portfolio can be an important factor in assessing the performance and management of an investment portfolio. However, in this study, the excess return is the Rm-Rf factor as the sensitivity of the portfolio to changes in the overall market. According to research by Hyde (2018), Leite et al. (2018) and Benali et al. (2023), the excess return variable has a positive or significant performance on portfolios listed on the Casablanca Stock Exchange (Morocco). Excess return can also provide an overview of the level of return obtained relative to the risk taken. If the excess return on risk is positive, this indicates that the investment or portfolio has succeeded in generating greater returns than expected based on the level of risk associated. In the results of the explanation above and based on the findings of previous studies, the suggested hypothesis is as follows:
H1: Excess Return has a positive effect on portfolio performance

The Effect of Small Minus Big (SMB) on Portfolio Returns
Positive exposure to SMB can have a beneficial effect on portfolio performance because the SMB factor reflects the difference in returns between stocks with high and low market capitalization values. If the company has positive exposure to SMB, it means that the portfolio has a relatively high allocation to small company stocks compared to large company stocks. The advantage of positive exposure to SMB is the potential to generate higher excess returns. According to research conducted by Domingues et al. (2022), the study explains that the small minus big factor has a positive or significant impact on the Piotroski portfolio, as seen in the Brazilian stock index. The proposed hypothesis, based on previous descriptions and research, is as follows:
H2: Small Minus Big (SMB) Has a Positive Effect on Portfolio Returns

The Effect of High Minus Low (HML) on Portfolio Returns
HML is based on the concept of stock valuation using the book-to-market ratio. This ratio is calculated by dividing the book value per share by the market price per share. High-value stocks have a low book-to-market ratio, indicating that the market price of the stock is higher than its book value. On the other hand, low-value stocks have a high book-to-market ratio, indicating that the market price of the stock is lower than its book value. The HML factor identifies the difference in returns between high-value and low-value stocks. If low-value stocks generate greater returns than high-value stocks, there will be a positive excess return on the HML factor. According to research conducted by Hu et al. (2019), Sehrawat et al. (2020), and Ali et al. (2021), the High Minus Low (HML) factor has a positive or significant impact on portfolio performance. The proposed hypothesis, based on previous descriptions and research, is as follows:
H3: High Minus Low (HML) Has a Positive Effect on Portfolio Returns

Framework of Thought

With a value investment strategy on stocks, portfolio performance can provide the best potential investment results. The Graham, Greenblatt, and Piotroski method is one of the methods based on value investing by looking at financial performance. With the following research framework:
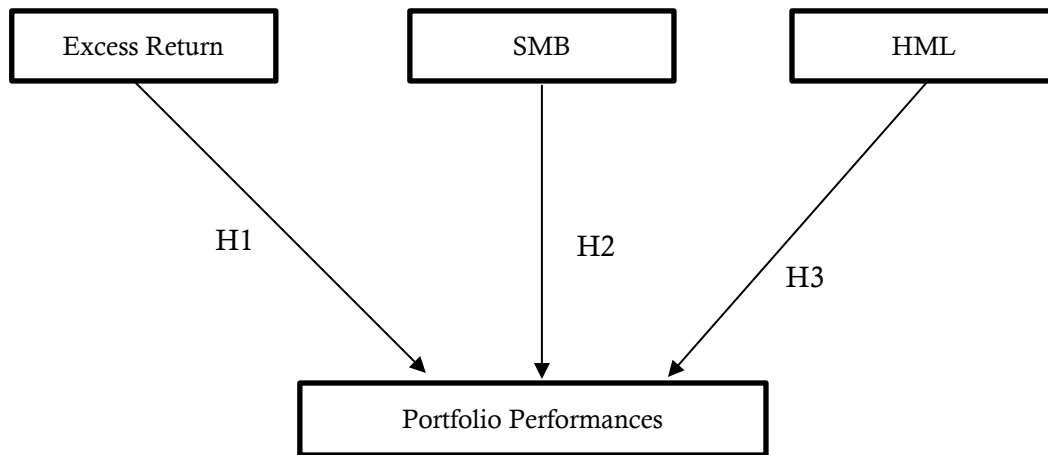

Figure 1. Framework of Thought

3. Data and Method

Research Type

This research employs a quantitative approach, emphasizing breadth, statistical description, and generalization. The quantitative method aims for objectivity, control, and precise measurement, relying on a deductive design to build evidence supporting specific theories and hypotheses. Explains that in quantitative research, the analysis process results in the presentation of statistical findings, typically displayed in tables or charts.

Research Object

The research focuses on stocks listed on the Kompas 100 Index, and three portfolio models are screened as part of the study. The choice of the Kompas 100 Index is deliberate as it encompasses 100 stocks of companies with the highest market capitalization and liquidity on the Indonesia Stock Exchange. This index is considered a reliable gauge of the overall performance of the Indonesian stock market, as it spans various industrial sectors. We utilizing the stocks within this index study aims to provide a more precise overview of the growth trend and stock performance over the past 5 years (2018-2022). Moreover, the Kompas 100 Index serves as a key benchmark for investors to assess market vitality. Consequently, the findings of this study hold relevance for investors in their decision-making processes.

Population and Research Sample

Research Population

All subjects are the population (objects, companies, events) or something that is the focus of the research. The population of this research observes and analyzes the financial statements of all stocks included in the Kompas 100 index, which can be accessed during 2022 through the Indonesia Stock Exchange website.

Research Sample

We use purposive sampling techniques to collect samples from companies. This collection explains that the sample will be selected based on certain criteria, and the purpose of this technique is to create a representative sample that meets these criteria. The sampling criteria are based on the Graham, Greenblatt and Piotroski methods.

Analysis Method

The study uses a quantitative approach to explain the phenomena that contradict each other. In addition, this method is used to test the causal relationship between variables and evaluate and find differences or comparisons between different conditions among the groups tested. This research test uses a statistical program tool, Eviews 12, and then a regression test is carried out to obtain the coefficients for each portfolio.

Multiple Linear Regression Test

The use of MKT, SMB, and HML indices in this regression model is based on the Fama-French Three Factor Model framework, which is widely used to explain stock returns more accurately. These indices were chosen because they are relevant in identifying more comprehensive risk factors in the stock market, thus helping to understand more deeply how various company and market characteristics affect stock returns in the context of this study.

The multiple regression equation in this study is as follows:

$$Return = \alpha + \beta 1 MKT + \beta 2 SMB + \beta 3 HML + \varepsilon i \tag{1}$$

4. Results

Multiple Regression Analysis Results of Graham Portfolio

The relationship between the estimated portfolio coefficients as dependent variables and the three model factors (Mkt, SMB, and HML) as independent variables is identified using multiple linear regression analysis. The data used include different investment portfolios over five years. The results of the regression analysis of this study indicate that the multiple linear regression model used has a high level of significance and a p-value of less than 0.05. To find out whether this model has an impact on the performance of the three portfolios, the researcher will conduct a classical assumption test on the Graham portfolio. By looking at the following portfolio results:

Table 1. Three Factor Model Portfolio Graham

Coefficient	Estimate	t - Statistic	Adjusted R-squared
α	0.00166	0.42729	0.836502
Mkt	0.65630	17.24257	
SMB	-0.00451	-0.83657	
HML	0.01830	2.67604	

Source: Processed Data 2023

The multiple linear regression analysis on Graham's portfolio shows that the Adjusted R-squared is 0.8365, which indicates that around 83.65% of Graham's portfolio is influenced by the independent variable. The constant value (α) has a positive value of 0.00166.

Results of Multiple Regression Analysis of Greenblatt Portfolio

In the Greenblatt portfolio, researchers found a relationship between coefficients using multiple linear regression analysis. Greenblatt portfolio alpha as the dependent variable and three model factors (Mkt, SMB, and HML) as independent variables. The results of the regression analysis in this study indicate that the multiple linear regression model used has a high level of significance and a p-value of less than 0.05. The results of the coefficients in the Greenblatt Portfolio are as follows:

Table 2. Three Factor Model Portofolio Greenblatt

Coefficient	Estimate	t -Statistic	Adjusted R-squared
α	6.44E-05	0.0183	0.739911
Mkt	0.520917	10.1739	
SMB	0.000618	0.0913	
HML	0.016130	2.3011	

Source: Processed Data 2023

The multiple linear regression analysis of the Greenblatt portfolio shows that the Adjusted R-squared is 0.739911, which indicates that the independent variables influence around 73.99% of the Greenblatt portfolio.

Results of Multiple Regression Analysis of Piotroski Portfolio
The researcher in this study used multiple linear regression analysis to identify the relationship between the estimated alpha coefficient of the portfolio as the dependent variable and the three model factors (Mkt, SMB, and HML) as independent variables. The results of the regression analysis indicate that the multiple linear regression model used has a high level of significance and a p-value of less than 0.05.

Table 3. Three Factor Model Portofolio Piotroski

Coefficient	Estimate	t -Statistic	Adjusted R-squared
α	0.002701	0.685017	0.737265
Mkt	0.586737	11.66731	
SMB	-0.003397	-0.63914	
HML	0.014025	2.366491	

Source: Processed Data 2023

The results of the multiple linear regression analysis on the Piotroski portfolio show that the Adjusted R-squared is 0.737265, which indicates that the independent variables influence around 73.72% of the portfolio.

Normality Test Results
The normality test in this study is to check whether the data in the Piotroski portfolio is normally distributed or not. The researcher used the histogram normality test method which is one of the common methods used. The data used in the normality test is portfolio return data over five years. The histogram data from each portfolio is as follows:
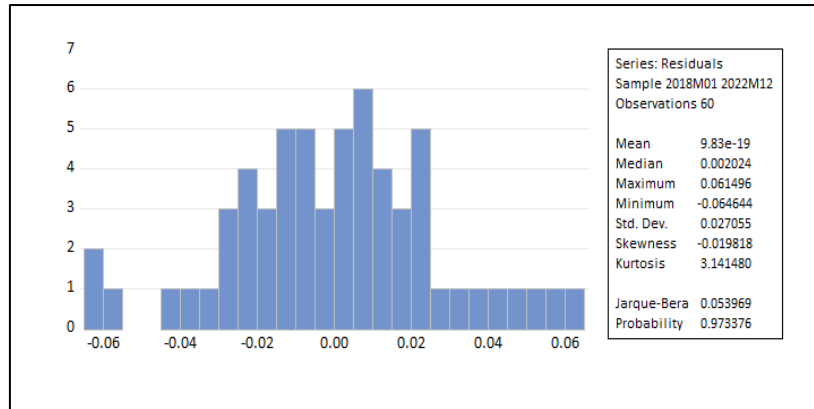
Figure 2. Graham Portfolio Normality Test

The results of the normality test on the portfolio show that the Jarque-Bera value on the Graham portfolio is 0.053969 with a p-value of 0.973376.

Multicollinearity Test Results

The researcher used the Variance Inflation Factor (VIF) method in the multicollinearity test to determine whether the Piotroski portfolio experienced multicollinearity problems between independent variables in the multiple linear regression model. Multicollinearity occurs when there is a strong linear relationship between two or more independent variables in the model, and a high VIF value indicates multicollinearity. The Variance Inflation Factor (VIF) values for each portfolio are as follows:

Table 4. Variance Inflation Factor

Variabel	Variance Inflation Factor		
	Portofolio Graham	Portofolio Greenblatt	Portofolio Piotroski
Mkt	1.004231	1.361312	1.093402
SMB	1.208642	2.017994	1.723948
HML	1.204622	1.612059	1.693461

Source: Processed Data 2023

According to the results of the multicollinearity test on the Graham, Greenblatt, and Piotroski portfolios shown using the variance inflation factor (VIF). Where, all independent variables, including the Mkt, SMB, and HML factors, have low variance inflation factor (VIF) values or below 4. Thus, the results show that in the multiple linear regression model, each portfolio does not show multicollinearity problems.

Autocorrelation Test Results

The researcher conducted an autocorrelation test on each portfolio to determine whether there was a correlation in the portfolio data. Autocorrelation occurs when there is a correlation between current and previous values. To determine the test results, the researcher compared the probability value with an alpha significance level of 0.05; if the probability value is more than 0.05, H0 is rejected, indicating that there is no autocorrelation. Conversely, if the probability value is less than 0.05, then there is autocorrelation. The autocorrelation test on the Graham, Greenblatt and Piotroski portfolios is as follows:

Table 5. Breuch Godfrey serial correlation LM test

Variable	Breuch Godfrey serial correlation LM test		
	Portofolio Graham	Portofolio Greenblatt	Portofolio Piotroski
Prob.Chi-squared	0.598	0.4837	0.2112

Source: Processed Data 2023

The results of Table 5 show that the Obs*R-Squared value for the Graham, Greenblatt, and Piotrosko portfolios has a Chi-Squared prob of 0.598, 0.4837, and 0.2112 greater than alpha 5% or more than 0.05, which indicates that autocorrelation has been met or passed the autocorrelation test.

Heteroscedasticity Test Results
This study uses a heteroscedasticity test through the Breuch Pagan method with the aim of additional regression. The Prob. The value of the alpha significance level of 0.05 on Chi-Square indicates that there is a heteroscedasticity problem in the Graham, Greenblatt and Piotroski portfolios. The Chi-Square Prob. Value for each portfolio is as follows:

Table 6. Breuch Pagan Heteroscedasticity Test

Variable	Heteroskedasticity Test: Breusch-Pagan-Godfrey		
	Portofolio Graham	Portofolio Greenblatt	Portofolio Piotroski
Prob.Chi-squared	0.1714	0.2623	0.0605

Source: Processed Data 2023

H0 is accepted because the results of the heteroscedasticity test using the Breuch Pagan method with Prob.Chi-Square on the Graham, Greenblatt, and Piotroski portfolios show values of 0.1714, 0.2623, and 0.0605, each of which is greater than 0.05.

5. Discussion
The Effect of Excess Return on Portfolio Performance
The results of the hypothesis test concluded that excess return has a positive effect on the performance of each portfolio. The results of this study are in line with previous studies conducted by Domingues et al. (2022), Benali et al. (2023), which stated that excess returns have a significant effect on each portfolio performance. However, research conducted by Sehrawat et al. (2020) showed that excess return is not the maximum on stock performance in India. This study shows that the excess return variable has a positive relationship, which means that if the portfolio generates additional profits, this indicates that the portfolio can exceed relevant standards. Excess profits indicate the ability of an effective investment strategy to generate greater profits than the market.

The Effect of Small Minus Big on Portfolio Performance
The results of the hypothesis test concluded that small minus big has a negative effect on the performance of each portfolio. The results of this study are not in line with previous studies conducted by Hu et al. (2019), Sehrawat et al. (2020), K. Li & Duan (2021), Benali et al. (2023), which stated that small minus big has a significant effect on each portfolio performance. However, according to Alaoui Taib & Benfeddoul (2023), Domingues et al. (2022) stated that the small minus big variable only has a slight effect on portfolio performance, while this study is in line that the small minus big factor has no effect on the Firefighter portfolio (High-tech industry companies, e-business industry, internet industry, clothing industry and food service industry in the American market). This study shows that the small minus big variable has a negative relationship, which means that the portfolio experiences underperformance or worse performance than a portfolio consisting of stocks with large market capitalization. This model

describes the performance differences between stocks with small market capitalization (small) and large market capitalization (big), Fama and French (2019). Thus, the negative small minus big indicates that overall, investors are more inclined to stocks with large market capitalization and give higher valuations to these stocks.

The Effect of High Minus Low on Portfolio Performance
The results of the hypothesis test concluded that high minus low has a positive effect on the performance of each portfolio. The results of this study are in line with previous studies conducted by Sehrawat et al. (2020), Ali et al. (2021), K. Li & Duan (2021), Domingues et al. (2022), Benali et al. (2023), Alaoui Taib & Benfeddoul, (2023) and (Santosa & Santoso, 2019)which stated that high minus low has a significant effect on each portfolio performance. This study shows that the high minus low variable has a positive relationship, which means that a portfolio that focuses on stocks with high valuations, this portfolio may have better performance or generate higher returns. If high minus low is positive, it indicates that the portfolio may generate higher returns because it focuses on stocks with low valuations. This value effect assumes that stocks with low valuations tend to have greater growth potential in the future than stocks with high valuations.

6. Conclusion
Based on the results of the study above, this study aims to show the value of the alpha coefficient in each portfolio and compare the return performance generated from the three value investing methodologies, namely Benjamin Graham, Joel Greenblatt and Joseph Piotroski. The results of the study are as follows: Excess return has a positive effect on the performance of the Graham, Greenblatt and Piotroski portfolios, and Small minus big (SMB) has a negative effect on the performance of the Graham, Greenblatt and Piotroski portfolios, High minus low (HML) has a positive effect on the performance of the Graham, Greenblatt and Piotrosk portfolios, Based on the results of backtesting and comparison of the three portfolios, Graham, Greenblatt and Piotroski against the Kompas Index, it shows that the one that is more optimal compared to the other two portfolios. The best method for analyzing the relationship between these variables and stock prices would be multiple linear regression analysis. This method allows you to assess the simultaneous impact of DER, EPS, and PER on stock prices, helping to identify the strength and direction of each variable's effect. By using multiple regression, you can control for the influence of each independent variable, ensuring more accurate and reliable results, especially when dealing with financial data. The managerial implications of the analysis of value investing strategies based on the Graham, Greenblatt, and Piotroski methods show that investment managers can optimize investment decisions by prioritizing undervalued stocks that have strong fundamentals. Through Graham's approach, focusing on the margin of safety protects against the risk of price declines.

Recommendation
After conducting an analysis and review of this study, the researcher concluded that it is necessary to make several necessary suggestions, in order to be considered by further researchers in forming a portfolio, namely: In subsequent studies, it is suggested to use investment growth or environmental sustainability and governance strategies through different approaches in certain time intervals, so that it can reflect more optimal portfolio performance.

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