

ANALYSIS OF FACTORS DETERMINING FAIR VALUE OF THE GREEN COMPANY BASED ON THE COMPONENTS OF ASSET PRICING MODEL

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Abstract

The fair value of a financial asset is the expected market price based on the fundamental condition of the asset which can be obtained using an asset pricing model. The pioneer of the asset pricing model is the Capital Asset Pricing Model (CAPM) which states that market risk is the only determining factor of fair value which will then determine the expected return. In further developments, several other asset pricing models emerged, namely multifactor models that include internal factors into the CAPM formulation. This study was conducted to test the robustness of the CAPM market risk factor on other asset valuation models that later emerged to criticize the model. The research period was 36 months (January 2021–December 2023) by taking samples of Kompas 100 Index stocks which are also included in sustainable indices, such as the Sri Kehati, ESG Kehati, and ESG Leader indices. The analysis was carried out based on the results of multiple regression tests, hypothesis tests, and classical assumption tests. The results of the study found that from a number of variables forming the CAPM components, the three-factor model, the four-factor model, and the five-factor model, it turned out that only the market risk factor, the company value factor, and the price momentum factor had an effect on the fair value of assets. The market risk factor was proven to remain consistently significant in each model.

Keywords: CAPM, Carhart model, five factor model, three factor model

INTRODUCTION

In the Plenary Meeting of the Opening of Session I of the Indonesian House of Representatives held in Jakarta on August 16, 2023, the President conveyed that the rapid economic recovery after the impact of the Covid-19 pandemic has succeeded in bringing Indonesia up to the upper middle-income country class in 2022. It was further stated that Indonesia's economic growth for the past seven quarters, since the end of 2021, has consistently been above five percent. This condition is directly proportional to the condition of the Indonesian capital market based on the performance indicator of the Composite Stock Price Index (CSPI) on the Indonesia Stock Exchange (IDX). CNBC Indonesia in mid-2022 noted that at the end of 2021, the positive performance of the CSPI reached 6,581.5 or increased by 10.1% annually or year on year (yoy), after experiencing a decline during the pandemic in 2020. The total value of the stock market capitalization at the end of 2021 was recorded at IDR 8,255.62 trillion or increased by 18.4% (yoy). The Director of Development of IDX also explained that the achievement of this performance was driven by IDX performance indicators that refer to several aspects, including investor perceptions of stock growth represented by the performance of the CSPI. The daily stock trading volume on November 9, 2021, even touched the highest record in IDX history, namely 50,982,543,199 shares. These conditions are sufficient to explain that after Covid-19, Indonesia has again received attention and consideration for investors in investing their funds. Investors will always place an interest in the stock value of each company listed on the exchange with the aim of making a profit.

The Capital Asset Pricing Model (CAPM) theory states that the opportunity to gain profit can be done by comparing the fair price or expected market price of an asset which will then form the expected return, with the actual market price so that it can be known whether it is undervalued or overvalued. When undervalued occurs, investors are advised to buy, conversely, if overvalued occurs, investors are advised to sell.

This fair price determination was first proposed by Sharpe (1964) with the Capital Asset Pricing Model (CAPM) theory which was later known as the pioneer of the financial asset valuation model. CAPM states that the only factor determining the fair price of a financial asset is the market factor or market risk. Furthermore, CAPM has become a model that is still debated until now because of several research findings that support and reject the theory. Some of these rejections are critical of one of the criteria but support other criteria. These models include those proposed by Fama and French (1993), namely the three-factor model, and Fama and French (2015), namely the five-factor model. Another model was proposed by Carhart (1997) which includes the price momentum factor, namely the four-factor model. In the three-factor model and the five-factor model, Fama and French still include market risk as an external factor forming prices combined with internal factors (idiosyncratic risk), namely size, value, profitability, and investment. While Carhart in the four-factor model, includes the price momentum factor into the Fama and French three-factor model.

Fama and French used the methodology used by Novy-Marx (2013) and Aharoni et al. (2012) in forming profitability and investment components. Profitability is measured using a comparison between the value of pre-tax profits and the equity available from the owners, while investment is measured using the value of the company's assets. The firm size and value components are measured using the company's stock market capitalization indicator and the comparison between book value and stock market value. The findings from the research results based on the three models have stated their support for the CAPM, related to the significance of the market risk factor, but do not support the CAPM theory which states that market risk is the only price determinant. (Fama and French, 2015; Sembiring et al, 2016; Sembiring et al, 2017; Sembiring, 2018a; Sembiring and Komara, 2020).

Fama and French's findings are that the five-factor model outperforms the three-factor model, but this model cannot explain why, on average, small stocks with low returns behave like companies that invest heavily despite their low profitability. In addition, with the addition of profitability and investment factors, the value factor becomes a redundant factor. In both the three-factor and five-factor models, risk factors are found to have an effect on returns, which strengthens the CAPM theory of market risk factors but also proves that idiosyncratic factors play a role in shaping market prices which will then shape returns. Sembiring et al (2016) proved that CAPM beta has an effect on returns and this effect is found to be stronger when the market is separated into bearish and bullish market conditions, resulting in a dual beta or conditional beta model (Sembiring et al, 2017). Especially in bearish market conditions (down market - down beta), in addition to market risk factors that strongly influence returns, the constant value (alpha) is also found to be insignificant, these results support the main theory in CAPM.

Continuing previous studies conducted when the market was proven to experience market overreaction anomalies, Sembiring (2018a) also tested the three-factor model and the five-factor model developed from the CAPM model by including internal factors (idiosyncratic). The test results on both models found that the three-factor model was actually better at explaining returns than the five-factor model, but when the market risk factor was removed from the model, the resulting estimation model did not improve, where the variables that originally influenced returns were now insignificant. This proves that the market risk factor (CAPM model) is robust. It was also found that in the five-factor model, the investment factor was unable to explain the returns obtained (redundant).

Furthermore, in market conditions that are assumed to be free from anomalies, Sembiring and Komara (2020) found that both the three-factor model and the five-factor model can explain

the portfolio well, but the firm size factor becomes redundant in the three-factor model while the investment factor becomes redundant in the five-factor model. It was also found that the five-factor model is relatively a better model compared to the three-factor model where market risk factors, firm value, and company profitability consistently affect returns, and this influence is found to be stronger in the five-factor model. This study also found that the market risk factor is not the only determinant of returns but is dominant as an influential factor.

Hou and Zhang (2017) tested the Fama and French (FF) five-factor model and the four-factor model in the Chinese stock exchange that they developed from the five-factor model but without including the value factor, called the Hou, Xue, Zhang (HXZ) model. This model uses return on equity (ROE) as a proxy for the profitability variable. The findings were that the investment factor in both the FF and HXZ models had no effect on returns, as found by Sembiring (2018a) and Sembiring and Komara (2020). Based on their findings, the factors they proposed to estimate stock prices or returns consist of market factors (CAPM in FF), FF value factors, modified firm size factors (HXZ model) and modified profitability factors (HXZ model).

Another model for determining stock prices or returns is the Carhart model which was developed from the FF three-factor model. From the results of his research, Carhart (1997) found that price momentum also affects prices. This model was later used by Sembiring (2018b) who found that price momentum affects stocks on the Indonesian stock exchange that provide high returns. Meanwhile, Ali et al (2021) who studied stocks on the Pakistan stock exchange found that the FF five-factor model was better than the FF three-factor model and the Carhart model. The profitability factor significantly affects returns, while the value and price momentum factors have no effect.

Furthermore, Dirkx and Peter (2020) tried to apply the FF five-factor model and then refined it with the Carhart price momentum factor on the German stock exchange. The findings from their research results are that by comparing the three-factor model and the six-factor model (FF factor and Carhart factor) it shows that the profitability and investment factors and price momentum cannot explain the returns obtained. They concluded that international asset pricing cannot be implemented in the specific conditions of the German capital market.

Then Atodaria et al (2021) conducted a study in the Indian stock market with the aim of providing a comprehensive analysis of two asset pricing models, namely CAPM and the FF three-factor model. They found that the CAPM market risk factor plays an important role in explaining the returns obtained. Stocks with high beta provide higher returns compared to stocks with low beta. On the other hand, stocks of large companies provide greater returns than stocks of small companies, this is inconsistent with the size anomaly considered in the FF model. In addition, it was also found that stocks of low-value companies provide greater returns than stocks of high-value companies. Both of these conditions do not support the assumptions used in forming the size and value factors in the FF model.

Tazi et al (2022) tested the validity of the FF three-factor model and the Carhart four-factor model on the Moroccan stock exchange or Casablanca Stock Exchange (CSE). The results of the study found that the Carhart four-factor model was no better than the three-factor model in explaining returns, but both models were also found to be unable to fully estimate and explain cross-sectoral returns. Then still at the CSE, Karima, et al (2023) tested the five-factor model and found that market risk factors, firm size, firm value, and profitability had a positive effect on returns, while investment factors had a negative effect. They also proved that the FF five-factor model was not fully able to explain cross-sectoral returns on the CSE. However, compared to the FF three-factor model and the Carhart four-factor model, the five-factor model is more likely to value assets in the stock market.

Furthermore, Rutkowska-Ziarko et al (2022) conducted a study on the London Stock Exchange to develop an alternative approach to testing the CAPM. They tested the CAPM by separating bearish and bullish market conditions, as previously done by Sembiring et al (2017) and obtained relatively consistent results.

Tang (2024) then conducted a study to examine the ability of the CAPM and the FF three-factor model to explain the variation in returns of sixteen leading company stocks in eleven industries. The results of his study showed that the CAPM only explains a small part of the variation in stock returns as seen from its determination coefficient, but the beta coefficient is significant in influencing. While the FF three-factor model produces a higher determination coefficient, but the size and value factors are only significant for a few stocks.

The results of the research that has been conducted state that the CAPM model remains an indicator or comparison for the three-factor, four-factor, and five-factor models, and produces findings that market risk factors measured by CAPM beta continue to influence stock price variations which will then shape returns. This indicates that this stock market risk factor remains a factor considered in assessing the price of stock assets or stock portfolios, so it remains relevant for further research.

In this study, a test will be conducted to determine how strong the CAPM market risk factor is in determining the price or value of assets. The assets studied are stocks with superior performance and concern for sustainability issues which are important factors in current investment activities. The variables to be tested are the components that form the variables in the three-factor, four-factor, and five-factor models, namely the size, value, profitability, and investment factors, as well as the price momentum factor which will be tested partially and simultaneously with the CAPM market risk factor.

Based on the description of the background that has outlined several phenomena and identified problems, the following problem is formulated: How do the variables forming the CAPM components, the three-factor model, the four-factor model, and the five-factor model influence the fair value of superior financial assets that care about sustainability issues?

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Capital Asset Pricing Model (CAPM)

Sharpe (1964) introduced the Capital Asset Pricing Model (CAPM) which relates the expected rate of return of a risky asset to the risk of the asset in an equilibrium market. Basically, the CAPM test is conducted to prove that: (a) the intercept value must be equal to the level of the risk-free asset ($\alpha = 0$); (b) the relationship between return and risk is linear and positive; and, (c) the only relevant risk measure is beta as a measure of market risk. CAPM is measured based on the equation model:

$$R_i = R_f + \beta_i (R_m - R_f) + e_i \quad \dots\dots\dots (1)$$

$$(R_i - R_f) = \alpha_0 + \beta_i (R_m - R_f) + e_i \quad \dots\dots\dots (2)$$

Fama and French's Three Factor Model

The three-factor model was developed from CAPM. Based on the results of observations that have been made, Fama and French (1993) introduced the model which consists of: market portfolio factors; small minus big (SMB) factors, namely the return of a small-cap stock portfolio minus the return of a large-cap stock portfolio; and, high minus low (HML) factors, namely the return of a stock portfolio with a high BE/ME ratio minus the return of a stock portfolio with a low BE/ME ratio, which is formulated:

$$R_{it} - R_{ft} = \alpha_i + b_i(R_{mt} - R_{ft}) + s_iSMB_t + h_iHML_t + \varepsilon_i \quad \dots\dots\dots (3)$$

where, SMB is calculated by the firm size indicator, namely market capitalization value, and, HML is measured by the comparison of book value and market value.

Fama and French's Five Factor Model

Fama and French (2015) then added profitability and investment factors to the three-factor model they had previously proposed and hereinafter referred to as the five-factor model, which is formulated:

$$R_{it} - R_{ft} = \alpha_i + b_i(R_{mt} - R_{ft}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + \varepsilon_{it} \quad \dots\dots\dots (4)$$

where, SMB is calculated by the firm size indicator, namely market capitalization value, HML is measured by the comparison of book value and market value, RMW is measured by the change in profit before tax, and, CMA is measured by the change in investment.

Carhart Four Factor Model

Furthermore, Carhart (1997) added the price momentum factor (MOM) to the three-factor model of Fama and French (1993), thus forming a model formulated as follows:

$$R_{it} - R_{ft} = \alpha_i + b_i(R_{mt} - R_{ft}) + s_iSMB_t + h_iHML_t + m_iMOM_t + \varepsilon_i \quad \dots\dots\dots (5)$$

where, SMB is calculated by the company size indicator, namely market capitalization value, HML is measured by the comparison of book value and market value, and, momentum is measured by the change in price or return.

Based on the empirical results of the asset valuation models explained previously, the hypotheses to be tested in this study are as follows:

1. *Market risk factors have a positive effect on the fair value of financial assets.*
2. *Size factors have a positive effect on the fair value of financial assets.*
3. *Value factors have a positive effect on the fair value of financial assets.*
4. *Price momentum factors have a positive effect on the fair value of financial assets.*
5. *Profitability factors have a positive effect on the fair value of financial assets.*
6. *Investment factors have a positive effect on the fair market value of financial assets.*

RESEARCH METHODS

Method

The research method used is quantitative research method.

Operationalization of variables

The operationalized research variables are as follows:

Independent variables:

- Market risk, which is the beta value measured through the regression process between excess return of market ($R_m - R_f$) and excess return of assets ($R_i - R_f$), where, R_m is the return of the market portfolio with the Composite Stock Price Index (CSPI) as its indicator, and, R_f is a risk-free asset with the interest rate of Bank Indonesia Certificates as its indicator.
- Firm size, measured by the value of stock market capitalization.
- Book value to market value, measured by comparing the book value and market value of the firm.
- Profitability, measured by the change in profit before tax this year with the previous year.
- Investment, measured by the change in investment this year with the previous year.
- Price momentum, measured by the change in price or return this year with the previous year.

Dependent variable:

- Fair value of financial assets, measured by excess return of stock ($R_i - R_f$), where R_f = risk free asset.

Research sample

The population in this study are stocks of companies included in the Kompas 100 Index, or 100 stocks with the highest liquidity levels during 2021 - 2023, based on monthly data (36 months). In addition to excelling through high liquidity indicators, these stocks are also green stocks, namely stocks included in the Sri Kehati, ESG Kehati, and ESG Leader sustainability indices.

The sampling technique used is purposive sampling, where based on the results of the selection carried out 2 (two) times in one year, namely February - July and August - January, the sample size in this study is 64 stocks.

Data processing and analysis method

Data processing is carried out by utilizing e-views software based on quantitative analysis methods, namely methods that use statistical analysis, especially multiple regression analysis of panel data. In addition, a classical assumption test is also carried out to ensure that the regression model is BLUE (best linear unbiased estimator). The tests include data normality tests, heteroscedasticity tests, multicollinearity tests, and autocorrelation tests.

RESULTS AND DISCUSSION

Results

This study aims to test and prove the hypotheses that have been formulated. Table 1 below displays the results of the data processing that has been carried out:

Table 1: Data Processing Results Based on Panel Data Regression

	C	Rm – Rf (X ₁)	Firm Size (X ₂)	BM Value (X ₃)	EBT (X ₄)	Investment (X ₅)	Momentum (X ₆)
1. CAPM	0.0021	0.6893***	-	-	-	-	-
	Adjusted R ²	0.0038					
	F-statistic	8.8595***)					
2. Three-Factor Model FF	0.0134	0.6729***)	1.50E-08	-0.0135**)	-	-	-
	Adjusted R ²	0.0057					
	F-statistic	4.3386***)					
3. Five-Factor Model FF	0.0139	0.6730***)	-1.87E-09	-0.0139**)	-0.0008	9.20E-09	-
	Adjusted R ²	0.0057					
	F-statistic	2.6216**)					
4. Carhart	0.0150	0.6384***)	1.62E-08	-0.0146**)	-	-	-0.1189***)
	Adjusted R ²	0.0197					
	F-statistic	11.4808***)					
5. CAPM + Momentum	0.0028	0.6579***)					-0.1173***)
	Adjusted R ²	0.0175					
	F-statistic	20.5227***)					
6. Five-Factor Model FF + Momentum	0.0155	0.6385***)	-2.02E-09	-0.0151**)	-0.0006	9.93E-09	-0.1189***)
	Adjusted R ²	0.0198					
	F-statistic	7.6675***)					

**) significant at α 5%

***) significant at α 10%

Based on the CAPM test, it is known that both through partial testing (t-test) and simultaneous testing (F-test), market factors (X₁) have a significant positive effect on the return or fair value of financial assets. The constant value of C is also proven to be insignificant, which strengthens the evidence of the robustness of CAPM as an asset pricing model. However, on the other hand, the low R-squared value proves that there are other factors that have the potential to affect returns besides market factors.

Based on the FF three-factor test, it is known that through partial testing (t-test) of all factors forming the Fama and French three-factor model (X₁ - X₃), only X₁ (market factor) and X₃ (value factor) are proven to have a significant effect on the return or fair value of financial assets. Market factors are found to have a positive effect while value factors have a negative effect. Meanwhile, through simultaneous testing (F-test) which is also a model test, it is known that all factors in the FF three-factor model simultaneously have a significant effect on returns.

Similar to the three-factor model, the five-factor model (X₁ – X₅) also obtained results that through partial testing (t-test) only X₁ (market factor) and X₃ (value factor) were proven to have a significant effect on the return or fair value of financial assets. Market factors were proven to have a positive effect and value factors had a negative effect. Meanwhile, through simultaneous testing

(F-test) which is also a model test, it is known that all factors in FF simultaneously have a significant effect on returns.

Based on the Carhart test that includes the price momentum factor into the Fama and French three-factor model, it is known that through partial testing (t-test), market factors (X1), value factors (X3), and momentum factors (X6) have a significant influence on the return or fair value of financial assets. Market factors are proven to have a positive influence while value factors and momentum factors have a negative influence. Through simultaneous testing (F-test) significant results were also obtained.

CAPM is then retested by including the momentum factor into the model. Through partial testing (t-test), it was found that against all factors forming the model, the market factor (X1) was found to have a positive effect while the momentum factor (X6) had a negative effect. Meanwhile, through simultaneous testing (F-test) which is also a model test, it is known that all factors in the model simultaneously have a significant effect on returns.

Based on the five-factor FF test by including the momentum factor, it is known that through partial testing (t-test) of all factors forming the model, only the market factor (X1), value factor (X3), and momentum factor (X6) are proven to have a significant effect on the return or fair value of financial assets. The market factor has a positive effect while the value factor and momentum factor have a negative effect. Meanwhile, through simultaneous testing (F-test), it is known that all factors in the five-factor FF model plus the Carhart momentum factor simultaneously have a significant effect on the return.

Discussion

The results of this study prove that from the internal factors of the company that have formed a multifactor model developed from the Capital Asset Pricing Model (CAPM), it turns out that only the value factor and momentum factor affect the fair value of assets, in addition to the market risk factor. Market factors are found to have a positive effect according to the CAPM model, while the value factor and momentum factor have a negative effect on the return that represents the fair price of the asset. These results support the findings of Fama and French (1993), Fama and French (2015), Sembiring and Komara (2020), Rutkowska-Ziarko et al (2022), dan Tang (2024).

According to the theory, the market risk factor stated in CAPM beta has a significant positive effect, this shows that the higher the risk that must be borne by investors in investing, the higher the asset return that will be received as compensation for the risk. This implies that the CAPM theory applies to all companies listed on the stock exchange, including companies that are committed to sustainability factors. These companies also continue to face market risks that will affect the price or fair return of assets. This is in accordance with the condition of "trade off" return and risk in investing, where "higher risk higher return".

Firm size, profitability, and investment factors were found to have no effect on returns or fair asset prices. This is in accordance with the findings of Hou and Zhang (2017), Dirkx and Peter (2020). Firm size does not automatically affect the returns of companies committed to sustainability. Although larger companies tend to have better access to capital and are more likely to gain public recognition, this does not always affect returns. Likewise, profitability and investment factors do not affect returns. Although profitability is an important factor for all companies, the impact of profitability may not always be immediately visible for companies concerned with sustainability. This may be because sustainable companies often invest in practices that provide long-term benefits, such as reduced emissions, efficient use of resources, and development of environmentally friendly products. Although the initial costs may be high, long-term benefits such as operational cost efficiencies, better reputation, and increased customer loyalty may be able to influence increased returns over a longer period of time. This also explains why investment has no effect on returns. Investments focused on sustainability, although important for the future of the company and the environment, often do not directly affect the price or return of the company's assets in the short term, but in the long term.

The value factor negatively affects the fair price or return of assets. The value of companies committed to sustainability has a negative effect because investors may consider investing in sustainable companies as a long-term investment that does not produce quick profits, especially if the company focuses on reducing environmental impact or improving society. Investors seeking quick profits may be more attracted to companies with low values that show assets that are worth more than their market price, which may be considered riskier but have the potential to provide higher returns. The price momentum factor was also found to negatively affect the fair price or return of assets. This is because companies committed to sustainability tend to provide lower, not higher, asset returns for several reasons. First, market perceptions of the company are often too optimistic, so that stock prices are already too expensive (overvalued) from the start. Second, although there is potential for long-term benefits from sustainability practices, investors may have difficulty measuring the impact directly and quickly, so that returns are relatively slow. Third, there is a positive sentiment bias towards sustainability that can cause the market to ignore the potential risks associated with the investment.

CONCLUSION

The conclusion of this study is that the market risk factor based on CAPM is proven to be a solid factor in forming a model that determines the price or fair return of financial assets. In multifactor models that include market risk factors, this factor remains consistent in positively influencing asset returns according to CAPM theory. This implies that CAPM theory applies to all companies listed on the stock exchange, including companies that are committed to sustainability factors. These companies also continue to face market risks that will affect the price or fair return of assets. This is in accordance with the condition of "trade off" return and risk in investing, where "higher risk higher return".

The firm size, profitability, and investment were found to have no effect on asset prices or returns, but it is suspected that if they are formed into the factors forming the Fama and French model, namely Small Minus Big (SMB), Robust Minus Weak (RMW), and Conservative Minus Aggressive (CMA), these factors will have an effect. Empirical results have supported this and explained why the firm size factor, profitability factor, and investment factor need to be formed into a model as proposed by Fama and French.

The value and price momentum affect the price or return of a reasonable asset but negatively. It has been explained in this study which is also supported by empirical studies. However, it is suspected that if it is formed in the Fama and French model, it is suspected that the value factor formed into High Minus (HML) will have a positive effect. While the Carhart momentum factor can have a negative or positive value empirically because it is influenced by market conditions that experience anomalies, whether market underreaction or market overreaction anomalies.

This research still needs to be continued with the proof of the assumptions that have been mentioned previously. It is necessary to compare the results obtained with subsequent research that can be done based on the application of the models that have been put forward by Fama and French through the three-factor model and the four-factor model, as well as those put forward by Carhart in the four-factor model. The further research has the potential to further clarify or strengthen the conclusions of this study.

BIBLIOGRAPHY

- Aharoni, G., Grundy, B. D., and Zeng, Q. (2012). Stock Returns and the Miller-Modigliani Valuation Formula: Revisiting the Fama-French Analysis. *SSRN Electronic Journal*, 61(0), 1–24. <https://doi.org/10.2139/ssrn.1800603>
- Ali, F., Khurram, M. U., and Jiang, Y. (2021). The Five-Factor Asset Pricing Model Tests and Profitability and Investment Premiums: Evidence from Pakistan. *Emerging Markets Finance and Trade*,

- 57(9), 2651–2673. <https://doi.org/10.1080/1540496X.2019.1650738>
- Atodaria, Z., Shah, D., and Nandaniya, J. (2021). *An Empirical Investigation of the CAPM and the Fama – French Three Factor Model in Indian Stock Market*. May.
- Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of Finance*, 52(1), 57–82. <https://doi.org/10.1111/j.1540-6261.1997.tb03808.x>
- Dirkx, P., and Peter, F. J. (2020). The Fama-French Five-Factor Model Plus Momentum: Evidence for the German Market. *Schmalenbach Business Review*, 72(4), 661–684. <https://doi.org/10.1007/s41464-020-00105-y>
- Fama, E. F., and French, K. R. (1993). Common Risk Factors in The Return on Stock and Bonds. *Journal of Financial Economics*, 33, 3–56.
- Fama, E. F., and French, K. R. (2015). A Five-Factor Asset Pricing Model. *Journal of Financial Economics*, 116(1), 1–22. <https://doi.org/https://dx.doi.org/10.1016/j.jfineco.2014.10.010>
- Hou, F., and Zhang, S. (2017). The Profitability and Investment Factors in Chinese Stock Market. *SSRN Electronic Journal*, July. <https://doi.org/10.2139/ssrn.2906084>
- Karima, Lahboub; Mimoun, Benali; El bouhadi, A. (2023). Fama and French Five-Factor Asset Pricing Model: Evidence From Moroccan Stock Market. *International Journal of Economics and Finance Studies*, 15(01), 466–489.
- Novy-Marx, R. (2013). The other side of value: The gross profitability premium. *Journal of Financial Economics*, 108(1), 1–28. <https://doi.org/10.1016/j.jfineco.2013.01.003>
- Rutkowska-Ziarko, A., Markowski, L., Pyke, C., and Amin, S. (2022). Conventional and downside CAPM: The case of London stock exchange. *Global Finance Journal*, 54(October 2021). <https://doi.org/10.1016/j.gfj.2022.100759>
- Sembiring, F.M., Rahman, S., Effendi, N., and Sudarsono, R. (2016). Capital asset pricing model in market overreaction conditions: Evidence from Indonesia stock exchange. *Polish Journal of Management Studies*, 14(2). <https://doi.org/10.17512/pjms.2016.14.2.17>
- Sembiring, Ferikawita M. (2018). How Well the Implementation of Carhart Model in Market Overreaction Condition? Evidence in Indonesia Stock Exchange. *International Journal of Engineering & Technology*, 7(4.38), 928. <https://doi.org/10.14419/ijet.v7i4.38.27611>
- Sembiring, Ferikawita M. (2018). Three-Factor and Five-Factor Models: Implementation of Fama and French Model on Market Overreaction Conditions. *Journal of Finance and Banking Review*, 3(4), 77–83. [https://doi.org/10.35609/jfbr.2018.3.4\(6\)](https://doi.org/10.35609/jfbr.2018.3.4(6))
- Sembiring, Ferikawita M., Rahman, S., Effendi, N., and Sudarsono, R. (2017). Single Beta and Dual Beta Models: A Testing of CAPM on Condition of Market Overreactions. *GATR Journal of Finance and Banking Review*, 2(3), 01–07. [https://doi.org/10.35609/jfbr.2017.2.3\(1\)](https://doi.org/10.35609/jfbr.2017.2.3(1))
- Sembiring, Ferikawita M. (2018). Three-Factor and Five-Factor Models : Implementation of Fama and French Model on Market Overreaction Conditions. *Journal Of Finance and Banking Review*, 3(4), 77–83. https://doi.org/https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3307370
- Sembiring, Ferikawita M, dan Komara, E. F. (2020). Analisis Capm Serta Model Multifaktor Fama & French Pada Perusahaan Non Keuangan Di Bursa Efek Indonesia. *Jurnal Kajian Akuntansi*, 4(2), 184–196. <https://doi.org/http://dx.doi.org/10.33603/jka.v4i2.3538>
- Sharpe, W. F. (1964). Capital Asset Prices: a Theory of Market Equilibrium Under Conditions of Risk. *The Journal of Finance*, 19(3), 425–442. <https://doi.org/10.1111/j.1540-6261.1964.tb02865.x>
- Tang, Z. (2024). *Risk-Return Analysis of Equity Portfolios: Comparison Between CAPM and Fama-French Three Factor Model*. Atlantis Press International BV. https://doi.org/10.2991/978-94-6463-246-0_28
- Tazi, O., Aguenau, S., & Abrache, J. (2022). A Comparative Study of the Fama-French Three Factor and the Carhart Four Factor Models: Empirical Evidence from Morocco. *International Journal of Economics and Financial Issues*, 12(1), 58–66. <https://doi.org/10.32479/ijefi.12685>