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# DOES INCLUDING MOMENTUM FACTOR INTO FAMA-FRENCH FIVE-FACTOR MODEL PREDICT BETTER RETURN IN INDONESIA?

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## Abstract

The addition of momentum factor to the Fama-French Five-Factor Model in recent studies encourages investors to reconsider their investment strategies. The aim of this research is to compare the explanatory power of the Fama-French Five-Factor Model Plus Momentum (FF5F Plus Momentum) and the Fama-French Five-Factor Model (FF5F) to portfolio return of stocks listed in the Kompas100 Index over the 2010-2019 period. This research also aims to describe the relation and significance of each factor (market risk, size, book-to-market equity or value, profitability, investment, and momentum) in the FF5F Plus Momentum model to the excess return. This research uses the Ordinary Least Square method for multiple linear regression on 115 observations done to the 24 portfolios formed. The research finds that the market risk premium, size and book-to-market equity have positive and significant effects on return, profitability and investment have no significant effect on return and momentum has negative and significant effect on return. FF5F Plus Momentum model is found to have higher explanatory power than the FF5F model. This result suggests investors to consider the stocks in the Kompas100 Index that have small market capitalization, high book-to-market equity and small yearly return in the previous one-year period for their portfolio.

**Keywords:** size; book-to-market; profitability; investment; momentum

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## Introduction

The explanation of portfolio return has been done using some mathematical models throughout the development of investment theories. Based on the Modern Portfolio Theory by (Markowitz, 1968), (Sharpe, 1964), (Lintner, 1969) and (Mossin, 1966) developed Capital Asset Pricing Model to show how market risk is the main factor that is deciding the return of a portfolio. (Eugene F. Fama & Kenneth, 1993) added size premium and value premium to the equation, due to the redundancy of market risk in some periods. This so called Fama-French three-factor model (FF3F) also empirically explain portfolio return better than CAPM. This addition of factor inspired other researches, such as (Carhart, 1997), adding momentum factor to the model and later on (Eugene F. Fama & French, 2015) with the Fama-French five-factor model

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(FF5F), added profitability factor and investment factor. Further researchers complete the explanation of each model to various markets, and also various modified models, and verify the explanation power of each model in the market chosen.

A research was conducted in Indonesia using the companies registered in LQ-45 index in the period 2013-2015. Both the FF3F model and the FF5F model were used and the results were analyzed. It was found that FF5F model was better than FF3F model in explaining portfolio return in Indonesia. Market risk premium, value premium and investment premium are positive and significant. Size premium is negative and significant. Profitability premium is not significant (Wijaya, Irawan, & Mahadwartha, 2018).

Another research in Indonesia used the companies in Indonesian Sharia Stock Index (ISSI) in the period 2013-2017. Momentum is added to the FF5F model and two portfolio constructions are used (2x2 portfolios and 2x3 portfolios). It was found that the 2x3 portfolios construction had bigger coefficient of determination than the 2x2 portfolios, so 2x3 portfolios construction is suggested for research on Fama-French nmodels. Market risk premium, value premium, investment premium, and momentum are positive and significant. Size premium and profitability is not significant (Sunarsih, 2020).

Various models are tested by (Foye & Valentinčič, 2020) on all stocks registered in IDX Composite Index in the period December 1995 – May 2017. FF5F model is found to give trivial improvement to FF3F model. FF5F model plus momentum was also tested and the result is similar: no meaningful improvement is offered by FF5F Plus Momentum model. Market risk premium, value premium, and profitability premium are positive and significant. Investment premium is negative and significant. Size premium and momentum are not significant.

This research uses the 2x3 portfolios construction recommended by (Sunarsih, 2020), compares models using coefficient of determination adapted from (Sunarsih, 2020) and (Wijaya et al., 2018) and use statistical tests following the methodology used by (Sunarsih, 2020). FF5F model and FF5F Plus Momentum model will be compared and the significance and directional relationship between the independent variables and the dependent variable will be analyzed.

**A. The Effect of Market Risk Premium on Portfolio Return**

Market risk premium is defined as the difference between market portfolio weighted-return and the risk-free rate (Eugene F. Fama & French, 2017). The market portfolio weighted-return used is the monthly return from indexes that represent the market observed, like IDX composite index, LQ-45 index, and Kompas100 index. Risk-free rate is the return of an investment that has zero risk.

Market risk premium was thought to be the only factor to determine the portfolio return in CAPM. But, (Eugene Fama & Kenneth, 1992) found that market risk premium failed to explain portfolio return in the period of 1941-1990. Researches conducted in Indonesia found that market risk premium is positive and

significant (Wijaya et al., 2018); (Sunarsih, 2020); (Foye & Valentinčič, 2020). Based on the previous research, the hypothesis of this study is stated as follows:

H1: The market risk premium has positive and significant effect on stock portfolio excess return in Kompas100 index.

**B. The Effect of Size Premium on Portfolio Return**

Size of a company is represented by the market value of the company's stock and calculated as the product of the company's stock price and the stock outstanding. Size premium is proxied by Small Minus Big (SMB) which is the difference of the average return of portfolio consisting of small companies and the average return of portfolio consisting of big companies (Eugene F. Fama & French, 2017).

Various results were found in accord with the relation of company size to stock return. Size premium was found to be negative and significant (Bantz, 1981); (Wijaya, S. C., Murhadi, W. R., & Utami, 2017), positive and significant (Handayani et al., 2019), positive and insignificant (Foye & Valentinčič, 2020); (Sunarsih, 2020). Based on the previous research, the hypothesis of this study is stated as follows:

H2: The size premium (SMB) has positive and significant effect on stock portfolio excess return in Kompas 100 index.

**C. The Effect of Value Premium on Portfolio Return**

Book-to-market equity ratio is defined as the ratio of the book equity for the fiscal year ending in t-1 and the market equity in the end of December at year t-1 (French, 2021). Book equity is the book value of stockholder's equity and is formulated as assets minus liabilities. Market equity is the market value calculated in the previous section. Value premium is proxied by High Minus Low (HML) which is the average return of portfolio consisting of companies with high book-to-market ratio and the average return of portfolio with low book-to-market ratio.

Value premium was found to be significant and positive (Wijaya et al., 2018); (Foye & Valentinčič, 2020); (Sunarsih, 2020). Based on the previous research, the hypothesis of this study is stated as follows:

H3: The value premium (HML) has positive and significant effect on stock portfolio excess return in Kompas 100 index.

**D. The Effect of Profitability Premium on Portfolio Return**

Profitability premium is proxied by Robust Minus Weak (RMW) which is the average return of portfolio with high operating profitability minus the average return of portfolio with low operating profitability.

Profitability premium was found to be positive and significant (Eugene F. Fama & French, 2017); (Foye & Valentinčič, 2020). In other research, profitability premium was found to be insignificant (Wijaya et al., 2018); (Sunarsih, 2020). Based on the previous research, the hypothesis of this study is stated as follows:

H4: The profitability premium (RMW) has positive and significant effect on stock portfolio excess return in Kompas 100 index.

**E. The Effect of Investment Premium on Portfolio Return**

Investment premium is proxied by Conservative Minus Aggresive (CMA) which is the average return of portfolio consisting of conservative companies minus the average return of portfolio consisting of aggressive companies.

Investment premium was found to be positive and significant (Eugene F. Fama & French, 2017); (Wijaya et al., 2018); (Sunarsih, 2020). In other research, investment premium was found to be negative and significant (Foye & Valentinčič, 2020). Based on the previous research, the hypothesis of this study is stated as follows:

H5: The investment premium (CMA) has positive and significant effect on stock portfolio excess return in Kompas 100 index.

**F. The Effect of Momentum on Portfolio Return**

Momentum is proxied by Winner Minus Loser (CMA) which is the average return of portfolio consisting of winner stocks minus the average return of portfolio consisting of loser stocks.

Momentum was found to be positive and significant (Wijaya et al., 2018); (Sunarsih, 2020). In other research, momentum was found to be insignificant (Foye & Valentinčič, 2020). Based on the previous research, the hypothesis of this study is stated as follows:

H6: The momentum (WML) has positive and significant effect on stock portfolio excess return in Kompas 100 index.

**G. The Explanatory Power of FF5F Plus Momentum Model and FF5F Model on Portfolio Return**

FF5F Plus Momentum model was found to be better in explaining portfolio return than FF5F model in Indonesia (Foye & Valentinčič, 2020). No other similar research was specifically conducted in Indonesia. Based on the previous research, the hypothesis of this study is stated as follows:

H7: The FF5F Plus Momentum model explains stock portfolio return in Kompas100 index better than the FF5F model.

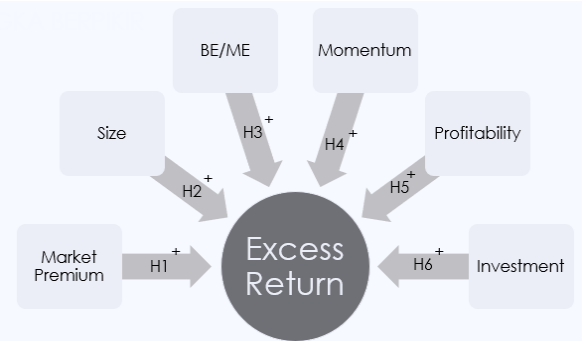


**Figure 1**
**Conceptual Framework**

**Research Methods**

The method used in this research was a quantitative approach. The dependent variable in this study is Kompas 100's stock portfolio excess return. The independent variable in this study was the Fama-French five factors, which are market return, size, book-to-market ratio, operating profitability, and investment as well as momentum factor. The purposive sampling method was done on the twenty-two companies in Kompas100 Index which follow the criteria of the research: (1) Company stocks listed in Kompas100 Index from January 2010 to December 2019, (2) Companies that consistently post their annual statement to the company website during the period aforementioned, (3) This study uses a sample of stocks listed on the Kompas100 index, with the number of observations 115 within June 2010 – December 2019 data period. Data are obtained from the annual statements of companies that have no negative equity. Portfolio is then formed using 2x3 portfolio formation. Twenty-two stocks that fulfill the requirements are divided into two based on their market equity, Small and Big. Stocks in each category are sorted by their book-to-equity. Six portfolios sorted by Size-B/M will be formed through these steps. Next, six portfolios will be formed by Size-Profitability sorting, six portfolios will be formed by Size-Investment sorting, and six other portfolios will be formed by Size-momentum sorting. A total of 24 portfolios will be tested for the classic assumption test and the multiple linear regression using OLS method is also conducted. The two models will be compared using the coefficient of determination of the two regressions found.

Market risk premium is the monthly difference between the market return and risk-free rate. The risk-free rate used in this research is the BI rate converted to monthly rate. SMB is the difference between returns of small companies and returns of big companies. HML is the difference between returns of high book-to-market equity companies and returns of low book-to-market equity companies. RMW is the difference between returns of high operating profitability companies and returns of low operating profitability companies. CMA is the difference between returns of conservative companies and returns of aggressive companies. WML is the difference between returns of winner stocks and returns of loser stocks. Excess return is the monthly difference between the 24 constructed portfolio and the risk-free rate.

This study uses multiple linear regression on two models which can be seen in formula (1) and (2).

$$R_{it} - R_{ft} = \alpha_i + \beta_i(RMRF_t) + s_i\, SMB_t + h_i HML_t + r_i RMW_t + c_i CMA + m_i WML_t + e_{it} \quad (1)$$

$$R_{it} - R_{ft} = \alpha_i + \beta_i(RMRF_t) + s_i\, SMB_t + h_i HML_t + r_i RMW_t + c_i CMA + e_{it} \quad (2)$$

In formula (1) and (2), $R_{it}$ stands for average portfolio return on period t, $R_{ft}$ stands for risk-free rate for period t, $RMRF_t$ stands for market risk premium on period t, $SMB_t$ stands for size premium on period t, $HML_t$ stands for value premium on period t, $RMW_t$ stands for profitability premium on period t, $CMA_t$ stands for investment premium on period t, $WML_t$ stands for momentum on period t.

**Results and Discussion**

Classic assumption tests are conducted on each model; The values of Jarque-bera probability for both FF5 Plus Momentum model and FF5F model are more than 0.05, showing no normality issue. White tests show value more than 0.05, so there are no heteroskedasticity issue. The two models are also free from autocorrelation issue, because the serial correlation test shows values more than 0.05. Then, the multicollinear test is conducted using Variance Inflation Factor (VIF) model. There is no multicollinearity issue if the VIF value is below 10. It is shown in Table 1 that the VIFs of all independent variables in this research are less than 10, so there is no multicollinearity issue.

**Table 1**
**Classic Assumption Test Results for the Two Models**

| | FF5F Plus Momentum | | | | | | FF5F | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | RMRF | SMB | HML | RMW | CMA | WML | RMRF | SMB | HML | RMW | CMA |
| Jarque-bera probability | 0.5172 | | | | | | 0.7979 | | | | |
| VIF | 1.08 | 1.25 | 1.42 | 1.41 | 1.20 | 1.10 | 1.08 | 1.25 | 1.30 | 1.40 | 1.20 |
| White (Prob > $chi^2$) | 0.9523 | | | | | | 0.4819 | | | | |
| Serial Correlation Test (12 lags) | 0.0912 | | | | | | 0.2540 | | | | |

After passing the classic assumption test, multilinear regression is carried out on the data. Table 2 shows the coefficient and the significance of each factor to the excess return of the 24 portfolios constructed.

Market risk premium shows a coefficient of 0.9805, showing a positive and significant relation with portfolio return. Thus, H1 is accepted: The market risk premium has positive and significant effect on stock portfolio excess return in Kompas100 index.

Size premium shows a coefficient of 0.2632, showing a positive and significant relation with portfolio return. Thus, H2 is accepted: The size premium has positive and significant effect on stock portfolio excess return in Kompas100 index.

Value premium shows a coefficient of 0.1709, showing a positive and significant relation with portfolio return. Thus, H3 is accepted: The value premium has positive and significant effect on stock portfolio excess return in Kompas100 index.

**Table 2**
**Test Results for the Two Models**

| | FF5F + Momentum | | FF5F | |
|---|---|---|---|---|
| | B | t | β | t |
| C | -0.0044 | -1.8184*** | -0.0044 | -1.7619*** |
| RMRF | 0.9805 | 17.1838* | 0.9691 | 16.2153* |
| SMB | 0.2632 | 4.8152* | 0.2513 | 4.3907* |
| HML | 0.1709 | 4.0450* | 0.2139 | 5.0482* |
| RMW | -0.0396 | -0.8884 | -0.0259 | -0.5561 |
| CMA | 0.0004 | 0.0099 | -0.0046 | -0.1096 |
| WML | -0.1110 | -3.4616* | | |
| Adj $R^2$ | 0.8026 | | 0.7828 | |
| F | 78.2703 | | 83.1498 | |

Note: *Sig at level 1% **Sig at level 5% ***Sig at level 10%.

Profitability premium shows a coefficient of -0.0396, showing a negative but insignificant relation with portfolio return (t-statistic = 0.8874). Thus, H4 is rejected: The profitability premium does not have positive and significant effect on stock portfolio excess return in Kompas100 index.

Investment premium shows a coefficient of 0.0004, showing a positive but insignificant relation with portfolio return (t-statistic = 0.0099). Thus, H5 is rejected: The investment premium does not have a significant effect on stock portfolio excess return in Kompas100 index.

Momentum shows a coefficient of -0.111, showing a negative and significant relation with portfolio return. Thus, H6 is rejected: The momentum factor does not have a positive and significant effect on stock portfolio excess return in Kompas100 index.

The adjusted $R^2$ of FF5F Plus Momentum model is 0.8026, higher compared to the adjusted $R^2$ of FF5F model (0.7828). Thus, H7 is accepted: The FF5F+Momentum model explains stock portfolio return in Kompas100 index better than the FF5F model.

## Conclusion

From the discussed models, it can be concluded that FF5F Plus Momentum model provides a better explanation on portfolio return than FF5F model. Following the FF5F Plus Momentum result, the market risk premium, size premium and value premium are positive and significant. Momentum is found to be negative and significant. Profitability premium and investment premium is found to be insignificant to the explanation of stock portfolio return in Indonesia.

This study has limitations, one of which is the result that momentum is negative and significant, because this is not consistent with previous findings. This may happen because investors in Indonesia may prefer losing stocks in hope that they will rebound and give higher return than the previous winning stocks. Using more samples or other portfolio formations are suggested to verify the findings in this research. There are also some other model tests which are not used in this research, that can be conducted to

further analyze the robustness of the FF5F Plus Momentum model to explain the stock portfolio return.

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