

Three Factor Model Analyses: Evidence on Indonesian Capital Market

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Abstract

The purpose of the study is to test how far the risk, size, and firm value variables of the Fama and French three factor model could explain the excess return of small and large stock portfolios in the Indonesian Capital Market (ICM). The study was conducted during 2016-2019 on the official 45 liquid shares namely LQ45. In this study, six portfolios were formed, which were produced from small and large portfolio groups. Each portfolio consists of small high, medium, low and large portfolio consists of large, medium and low. The results showed that market risk for all small and large portfolios have a positive and significant effect. In contrast to company size, size has a significant effect on small, medium, low and large high portfolios. While large low and medium portfolios are not significant. Testing the effect of company value on small and large portfolio excess returns is significant except for the small low portfolio. In general, the three-factor research model is a pretty good model to explain portfolio excess returns in Indonesia.

Keyword: Three Factor Model • Market risk • Size • Firm value • Excess return portfolio

Introduction

The phenomenon of investment returns in the capital market is still an interesting research topic to be addressed. Various indicators and variables have been developed to create a return prediction model. The CAPM model is a predictive model using market risk as a variable that determines returns [1] and capital costs [2]. Some research results show that as a model of predictions, CAPM produces conclusions that are still low as a predictive model compared to the three factor model [3,4]. Fama and French [5] explain that the three factor model is able to absorb most CAPM anomalies. The Fama and French model added two additional risk factors to the CAPM to better explain the variation in returns and increase the explanatory power of the CAPM. Furthermore, Fama & French [5] and Lin [6] capture the relationship between average return and market risk, size, leverage, market to book equity and earning price ratio. The results of the study concluded that market risk is not related to size, and the relationship between market risk and average return is flat. Rosenberg [7] found that the average return on stocks in the USA had a positive correlation with the book value ratio of equity (BE/ME). Chan [8] found that book-to-market equity also had a strong role in explaining average returns on shares in Japan.

One interesting phenomenon is that small company shares have lower earning tendencies than large company stocks [9-13]. However, various studies on the Size Effect illustrate the phenomenon that small companies provide higher returns than large ones [11,14-16]. Those research results confirmed that the anomalies the efficient market hypothesis could not explain properly. Meanwhile, market portfolio efficiency implies that the expected return on securities is a positive linear function of the market. In general, most research is conducted in developed markets while such research topics are under-explored in developing markets such as Indonesia. Some research findings found that developing country capital markets behave differently from the developed ones [1].

This study examines how the application of the three factor model in making a prediction of excess portfolio return on investments in the Indonesian

capital market. This study details the size of the companies into small high, small medium, small low and large high, large medium and large low in the formation of investment portfolios by adding market risk and firm value to predict portfolio excess returns. This research was designed in such a way that the resulting model contributed to the modelling by grouping size in more detail considering that some previous studies focused more on large or small group stock portfolios. The aim of this research is to find out how far this model is able to capture the level of excess return on the average portfolio formed based on company size in more detail.

Literature Review

Markowitz was the first person who predicted the return on an investment by forming a portfolio. Markowitz argued that the optimal portfolio results from a comparison between return and risk reflected in the efficient frontier line. Based on the Markowitz model, each investor is assumed to construct the portfolio and choose the optimal portfolio based on risk preferences.

CAPM was developed based on the Markowitz model (1952). This theory explains the relationship between risk and the rate of return of assets when the assets are in a well-diversified portfolio. Some researchers, including Dolinar [1] support the CAPM which finds a linear relationship between the rate of return and market risk. However, Banz [14] criticizes CAPM by showing that company size provides a better explanation than beta regarding the cross-sectional variation in average returns on some important assets. This study is supported by Fama & French [5] in their research stating that the CAPM beta (market risk) is not the only factor explaining the variation in stock returns. In addition to beta, size as measured by Market Value of Equity (ME), and Book to Market Equity (BE/ME) ratio have a significant strength in explaining the variation in stock returns. Fama & French [5] found that in the period 1963-1990 the role of beta as a factor explaining stock returns disappeared. In addition, stocks with small firm equity outperformed large stock returns, known as the size effect phenomenon.

On the other hand, the return of stocks which has a high book to market equity ratio outperformed the return of stocks which has low book to market equity ratio. This phenomenon is known as the value effect. Research conducted by Barbee et al. also shows that firm size has a negative effect on stock returns by using market value equity (MVE) as a proxy. Consistent with the results of Banz; and Reinganum [15] reinforces this argument by showing that there has been an inverse (negative) relationship between company size and stock returns. According to this result, stocks of small companies provide a higher return than the large companies. In contrast to Eraslan [10] companies with

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large sizes generate greater returns.

Three Factor Model of Fama & French [2] combines market risk premium, value premium and size premium as predictive variables for portfolio excess returns. Through this model, they offer portfolio formation based on market capitalization, book to market and earnings to price in expecting a better perspective on portfolio excess returns [8,17]. Furthermore Fama & French [2] and Borchert found that the addition of two factors (size and firm value) in their research model has proven that both variables are better variables for examining portfolio performance. They highlight that firm and size value contributes more in determining annual returns compared to portfolio manager skills. Most Book-to-market (value) ratios are able to capture variations in asset returns in studies based on equity markets. Based on the literature review above, the hypotheses in this paper are:

H1 : Market risk affects portfolio excess return

H2 : Firm size affects portfolio excess return

H3 : Firm value influences portfolio excess return

Methodology Adopted

Population in this study are all companies listed in LQ-45 in the period of January 2016 - December 2019. The sample is all of companies that are consistently listed in the LQ-45 index during the study period. The dependent variable in this research is portfolio excess return ($R_p - R_f$), measured by the weighted average of the realized returns of each single security in the portfolio minus the risk-free rate. Independent variables consist of three, namely 1) Market Risk, measured by the difference between the monthly market return (CSPI) and the risk-free rate. 2) Firm size, measured by the closing price of shares in the period times the number of shares outstanding in the period t , size in this study is proxied by the average portfolio return of small (Small-low, Small-medium, Small-high) minus the average of large portfolio returns (Large-low, Large-medium, Large-high). 3) Firm Value, measured by the ratio of the market price of a stock to its book value which is proxied by the average high portfolio return (Small-high, Large-high) minus the average portfolio return low (Small-Low, large-Low).

The research problem will be answered by using the multiple regression research models with the following equation:

Excess Return Portfolio= $\alpha + b_1$ (Market risk) + b_2 (Firm size) + b_3 (Firm value) + e

The classic assumption test will be performed before the regression analysis is used to test the hypothesis. Test classic assumptions to ensure the data used in this study is free from problems of normality, multicollinearity, heteroscedasticity, and autocorrelation. Partial hypothesis testing will be carried out with the t-test after the simultaneous test is carried out using the F test.

Statistical Results

The study grouped the investment portfolio of shares into six groups, namely the portfolio of large companies with large-high, large-medium, and large-low and three other investment portfolios are the portfolio of small companies with small-high, small-medium and small-low. Referring to the sample criteria, a small and high portfolio of 30 company shares was obtained. The number of companies for each portfolio group can be seen in Table 1.

Table 2 shows the descriptive statistical results of excess portfolio return. On average, the excess returns of the six equation portfolios are negative, meaning that the return is lower than the risk-free rate. Nevertheless, the generated firm value on average is positive. It means that the market still values the stocks in the portfolio group at a high price even though the average return is below the risk-free rate.

The statistical research model meets the classical assumption test requirements. This means that the research data meet the normality requirements; there is no multicollinearity, heteroskedasticity and autocorrelation. According to statistical data generated from the research model (Table 3), there are 6 (six) equations can be derived as follows:

$E(RP) \text{ Small-Low} = 0.005 + 1.441 \text{ Market Risk} + 0.683 \text{ Firm Size} - 0.183 \text{ Firm Value}$

$E(RP) \text{ Small-Medium} = 0.001 + 1.060 \text{ Market Risk} + 0.804 \text{ Firm Size} + 0.313 \text{ Firm Value}$

$E(RP) \text{ Small-High} = 0.015 + 1.358 \text{ Market Risk} + 0.855 \text{ Firm Size} + 0.634 \text{ Firm Value}$

$E(RP) \text{ Large-Low} = -0.041 + 0.678 \text{ Market Risk} - 0.078 \text{ Firm Size} - 0.076 \text{ Firm Value}$

$E(RP) \text{ Large-Medium} = -0.046 + 0.787 \text{ Market Risk} + 0.008 \text{ Firm Size} + 0.180 \text{ Firm Value}$

Table 1. Number of Companies in the Portfolio Group.

Year	Small-High	Small-Med	Small-Low	Large-High	Large-Med	Large-Low	Totals
2016	6	6	3	3	6	6	30
2017	8	5	2	1	7	7	30
2018	8	4	3	1	8	6	30
2019	8	5	5	1	7	7	30

Source: Processed Data.

Table 2. Descriptive excess return.

Portfolio Category	Mean	Standar Deviasi
Small-Low	-0.062	0.078
Small- Medium	-0.043	0.059
Small-High	-0.047	0.075
Large-Low	-0.041	0.033
Large-Medium	-0.046	0.053
Large-High	-0.036	0.1
X1 Market Risk	-0.044	0.023
X2 Firm Size	-0.006	0.054
X3 Firm Value	0.005	0.07

Source: Processed Data

$E(RP)_{Large-High} = 0.021 + 1.423 \text{ Market Risk} - 0.404 \text{ Firm Size} + 0.830 \text{ Firm Value}$

The OLS statistics results shown in Table 3 indicate that the effect of market risk on portfolio excess returns in the small and large stock groups in respect to low, medium and high, all of which have a positive and significant effect at 1% alpha. But the effect of firm size on small and large portfolio excess returns with the same three categories shows different results. Firm size positively affects portfolio excess return for all categories (low, medium and high) on a small stock portfolio at a 99% confidence level. While the large-high stock portfolio has a negative and significant effect, while for large-low and large-medium portfolio are not significant.

The effect of firm value on excess return portfolio on small portfolios is not significant in the low category, while in the high category is significant. The large stock portfolio in the high category has a positive and significant effect; but in the low category, it has a negative and significant effect. Table 4 explains the simultaneous statistical tests showing significant results for both small and large stock portfolio categories. These results can be interpreted that market risk, firm size and firm value together affect portfolio excess return at a 99% confidence level.

The coefficient of determination (R^2) in all equations has a value between 42% - 90%, (Table 5). These results indicate that the model is able to explain the dependent variable quite high. This means that market risk, firm size and firm value variables can contribute in explaining the dependent variable, namely Excess Return portfolio (Book to Market Equity) well.

Discussion

The first hypothesis statistical test found that market risk has a positive and significant effect on excess return portfolio so that H1 is supported. This finding states that the higher the market risk, the higher the investor's expected excess return. These findings also confirm Abbas et al. [18] which states that market risk variables have a positive and significant effect on

stock portfolio excess returns. On average, the market risk of a small stock portfolio has a greater coefficient than the risk coefficient of a large stock portfolio. This finding confirms Vanden [19] the results of this study also support the Fama-French Three Factor Model which states that the excess market return is derived from the difference between stock returns and the risk-free rate confirming the expected required portfolio return.

The second hypothesis statistical test showed that the coefficient value of firm size has a significant positive effect at a significant level of 1% for small portfolios. This means that the larger the size of a small company, the greater the excess return on its stock portfolio. These results support the research of Abbas et al. and Chandra Teddy [18,20] which states that variable size has a positive and significant effect on stock excess returns on small portfolios. These findings indicate a tendency that the larger the size of the small portfolio category companies will produce a higher portfolio return.

Testing of large-high portfolios shows different results that in companies, size and return show the opposite direction. These results are in line with [9,12,13] who stated that small size has a higher return than large size. In general, the results of this study support the Fama-French Three Factor Model which states that size affects investors in estimating excess required portfolio returns.

The third hypothesis testing shows that firm value has a positive and significant effect on excess return portfolio on the small and large portfolio with the high category. This finding shows that the higher the firm's value, the higher the excess return expected by investors. These results confirm Abbas et al. [18]. The positive effect of firm value on portfolio excess return supports the Three Factor Model which states that firm value that is proxied by excess return book to market equity affects investors in estimating portfolio excess returns. However, different conditions occur in small and large portfolios with low category, namely the value of the company and the return portfolio move in the opposite direction. According to the significant result, the higher the value of the company, the lower the expected return prediction. The reason to support this argument is that the shares in the group are overvalued so

Table 3. OLS regression results and statistical T-test.

Hypotheses	Portfolio	β Coefficient	pvalue	Accept/Reject
Market risk influence On the excess return portfolio Small-med (H1)	Small-Low	1.441	0.0001***	Accept
		1.06	0.0000***	Accept
	Small-High	1.358	0.0000***	Accept
	Large-Low	0.678	0.0000***	Accept
	Large-Med	0.787	0.0001***	Accept
	Large-High	1.423	0.0002***	Accept
Firm Size influence on the excess return portfolio (H2)	Small-Low	0.683	0.0002***	Accept
	Small-Med	0.804	0.0000***	Accept
	Small-High	0.855	0.0000***	Accept
	Large-Low	-0.078	0.1161	Reject
	Large-Med	0.008	0.9222	Reject
	Large-High	-0.404	0.0289**	Accept
Firm value influence excess return portfolio (H3)	Small-Low	-0.183	0.1725	Reject
	Small-High	0.634	0.0000***	Accept
	Large-Low	-0.076	0.0785*	Accept
	Large-High	0.83	0.0000***	Accept

Source : Output Eviews 10, Note : Significant at level *** = 1%, ** = 5%, and * = 10%.

Table 4. F-test results of 6 portfolios.

Table 4.1: Test results of 9 portfolios.						
Portfolio/Category	F statistik			F Significance		
	Excess Return Portfolio (BME)					
	Low	Medium	High	Low	Medium	High
Small	15.547	71.667	115.923	0.00***	0.00***	0.00***
Large	12.254	11.289	28.986	0.00***	0.00***	0.00***

Source : Output Eviews 10.

Table 5. Adjusted R Square 6 portfolio.

Portfolio/Category	Excess Return Portfolio (BME)		
	Low	Medium	High
Small	0.546	0.838	0.9
Large	0.452	0.423	0.69

Source: Output Eviews 10.

they drive the lower return portfolio such that demand and supply will move the price to the new equilibrium one.

Conclusion

The purpose of this study is to explain portfolio excess returns using a three-factor model from Fama and French. The variables used to explain the effect of excess portfolio return are market risk, company size, and firm value. The estimation results show that the three-factor of Fama and French models have the ability to explain portfolio excess returns. The empirical part of this research is that based on the excess return portfolio of the three-factor model successfully formed six statistical models. The statistical test generates conclusions in supporting the previous theory that market risk, company size, and firm value affect the small and large excess portfolio return on the Indonesian capital market. An interesting conclusion from this study is that an increase of market risk in small companies (small size) tends to give a higher return than the increase in market risk for large companies (large size).

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