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The Effect of Market Excess Returns, Size, Market-to-Book Ratio and Earnings Yield on Stock Returns

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Abstract: This study investigates the effect of both Fama and French three-factor model (consisting of market excess returns, size and market-to-book ratio) and earnings yield on stock returns in companies listed on Bursa Efek Indonesia. The result shows that stock returns are not affected by only market excess returns but also by size and market-to-book ratio. Moreover, earnings yield helps the three-factor model to capture more variation in stock returns, suggesting that the involvement of earnings yield has improved the efficiency of the Fama and French three-factor model.

Key words: Fama and French three-factor model, small size effect, stock return, market excess, book ratio

INTRODUCTION

Stock returns are the most important concern that will always be considered as the focal point when investors plan to put their money, into any financial and/or real assets. Higher returns would be entailed by higher risks and vice versa. Investors have to consider their decision in investing their money according to their risk-taking capabilities. Many theories have evolved to guide investors in measuring their appropriate risk for a given particular level of return which will help them to make their decision easier. But, not all theories created can be practiced in different markets and times. Anomalies could occur in every different condition of the global market.

Most empirical studies either from developed and emerging markets (Chen and Tu, 2000; Charitou and Constantinidis, 2004) were much concerned on testing the three-factor model of Fama and French (1993) where most of the findings showed significant values for each factor in the model. Fama and French (1992) suggested that earnings yield is also another variable that was found to be a significant factor in explaining stock returns. Bekaert *et al.* (1998) reported that the results obtained either from developed and emerging markets on earnings yield are similar.

In this study, two models are used to measure stock returns on the Indonesia equity market Bursa Efek Indonesia (BEI) by employing:

- Existing model: Three-factor model of Fama and French (1993)
- New model: The three-factor model of Fama and French (1993) with additional variable of risk factors (i.e., earnings yield)

In the US equity market, 90% of variations in stock returns could be explained by the three-factor model and it is expected that by adding risk factors in the new model, it could help explain more variations in stock returns. In line with the study, undertaken by Bekaert *et al.* (1998) and Aydogan and Gursoy (2001) reported that the earnings yield was found to have a significant explanatory power in explaining stock returns after market risk for both developed and emerging markets. They argued that the statistically significant earnings yield could be used as a proxy for an efficient market or a signal of mispricing on a particular stock.

Indonesia is used in this context of the study because Indonesia as one of the largest emerging markets in Southeast Asia has a very high volatility and average returns. This difference, compared with other developed markets is commonly due to a heterogeneous nature and inherent dynamics. Bekaert *et al.* (1998) reported that Bursa Efek Indonesia (BEI) are not integrated with developed markets as evidenced by its very low correlation with the rest of the world markets.

As stated in the National Paper of Indonesia in the finance section, it showed that most people who relied on their portfolio to national market portfolio (Indeks Harga

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Saham Gabungan/IHSG) experienced huge losses due to a fall of 0.80% or 28.059 points to level off at 3,503.418. This phenomenon was also supported by another study, Kompas Merah in the business section on February 25, 2011 when IHSG opened higher than the last day closing price which only hold for a moment and suddenly fell to 8.59 points (0.25%) or 3,430.546 which was followed on March 2, 2011 by IHSG even reaching below the 3,500 level where the previous day was at 3,512.617.

Prior studies that examined the stock return predictions on the Indonesian equity market are sparse. The only study by Hardianto and Suherman (2009) showed significant relationship between all the factors in the Fama and French three-factor model on stock returns, using data from year 2000-2004.

Supporting details above showed that investors in Indonesia still lack empirical evidence in predicting factors that will affect movement of stock prices on the BEI. Even though most prior studies were concerned with the three-factor model, the study include the earnings yield for that model as a new model in predicting stock returns, using data from the emerging market, Indonesia. This study contributes to the literature by filling the gap on the consistency of the model over time. Even though, several studies have been conducted on the Fama and French three-factor model using data from developing and emerging countries but not by combining the three-factor model and earnings yield. Furthermore, the earnings yield variable that was added to the model would help explain the variation in stock returns.

The study adopts the Fama and French three-factor model as a role model and improves the model by involving the earnings yield as systematic risk and as a biased indicator for the new model. Using time-series regression, researchers find that the stock returns are affected by market excess returns, size and market-to-book ratio which are the properties of Fama and French three-factor model. Interestingly, researchers find that adding earnings yields as an additional variable has improved the efficiency of Fama and French three-factor model and explanatory power of stock returns. The results help the Indonesian government and other related parties to improve, their analysis and forecasting for the equity market and assist them in making investment decision.

Literature review and hypotheses: Fama and French (1992) commented on the usefulness of CAPM where market beta (β) only had a little ability and was even incapable of capturing all stock variations on the US stock market. They proposed three-factor model in order to find a more accurate model that could explain variation on stock returns. Later, Fama and French (1993) created the three-factor model to capture more variation on stock returns by including firm size and book-to-market. Furthermore, Fama and French (1993) contended that small firms' stock would perform better than big firms' stocks for 11 out 16 stock markets that were tested by them and value stocks (high book-to-market ratio) would perform better and offer higher returns compared to growth stocks (low book-to-market ratio) in 12 out of 13 major markets for the period 1975-1995.

Basu (1977) who tested a sample from April, 1957 until March, 1971 concluded that a lower P/E ratio (high E/P ratio) stock offer had higher returns compared to a higher P/E ratio (low E/P ratio). His findings were consistent with Jaffe *et al.* (1989). Banz (1981), on his study about size effects, found that small firm size stock could beat big firm size stock. Basu (1983) also found that a low P/E ratio had a higher adjusted risk compared to a high P/E ratio over differences in firm size and in addition, found that small size firms in NYSE could earn substantially higher returns compared to their larger counterparts. Meanwhile, a study that was conducted by Rosenberg *et al.* (1985) concluded that there was a positive relationship between market-to-book ratio and expected returns.

Fama and French (1992) introduced the three-factor model by conducting a study in predicting relationships between market excess returns, size and book-to-market ratio towards stock excess returns. In the study conducted, for stocks on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and NASDAQ stock market, Fama and French (1992) stated that there is a cross-sectional relationship between firm size and book-to-market equity toward average return of stocks. They contended that size and book-to-market ratio were the factors that could explain return sensitivity toward risk. Furthermore, firms were divided into 10 groups based on book-to-market ratio and tested monthly returns for each group for the period July, 1963 to December, 1990 in their study. Their result showed that the group with the highest book-to-market ratio had average returns of 1.65%, meanwhile the group with the lowest book-to-market ratio only had an average return of 0.72% monthly. Surprisingly, after the book-to-market ratio effect took a place in explaining stock returns, beta (β) did not have any more effect in explaining stock returns. This finding is an important challenge for rational notions. This is because beta (β) which was believed to show systematic risk and the only factor that could explain stock returns, only has a small explanatory

power for stock returns where other factors, such as book-to-market ratio could predict more approximately future stock returns.

In Fama and French (1992), it was found that economic fundamentals could be influenced by size and book-to-market equity. High book-to-market equity firms show a trend of having less earnings on assets compared to low book-to-market equity firms. This trend on earnings could last for at least 5 years before and after the ratio was measured. Building upon that evidence, book-to-market equity could be a proxy for common risk factors in returns. Furthermore, they also found that the relationship between book-to-market equity and average return of stock returns is categorized as strong with a t-stat value of 5.71.

Size also had a significant relationship with average stock returns (Fama and French, 1992, 1993). Size is related to profitability. On the other hand, book-to-market ratio and size have a negative relation with average stock returns. Small size firms show a trend of having less earnings on assets compared to big size firms. As discussed with the book-to-market ratio, the trend shows the size effect was suggesting that relative profitability is also related with common risk factors. The relationship of size and average stock returns should also not be underestimated since the significant relationship is quite strong, the t-stat shows 2.58 for size on average stock returns. The size factor also explains the reason why market return does not play a huge role in explaining variations of average stock returns. The E/P ratio is mostly used as a biased indicator of investor perceptions. A high E/P ratio could perform better than a low E/P ratio for both short-term and long-term due to underrated considerations of high E/P ratio stocks.

In their other study, Fama and French (1993) provided tests that presented the book-to-market ratio and size as proxies of firms' loading on risk factors for certain prices. This was explained by the findings of their study which showed small size and high book-to-market ratio firms' stock price tended to go up and down more easily.

In their study, Fama and French (1993) contended that size and book-to-market ratio were sensitive toward risk factors which were also factors that could predict stock return variation and help to explain the time-series of average returns. Evidence from the study revealed that firm size and book-to-market ratio were related to profitability obtained by firms.

Fama and French (1992), Chan *et al.* (1991) and Lewellen (1999) found a positive and remarkably strong relationship between book-to-market ratio and stock returns. In addition, Fama and French (1993) find a negative relationship between book-to-market ratio and stock returns, especially for low book-to-market ratio which is applied for all firm sizes.

Charitou and Constantinidis (2004) carried out a study on Japanese stocks from 1992-2001 by examining the size and book-to-market ratio relationship with profit. Based on the study, it was found there are significant relationships between market excess returns, size, book-to-market ratio and stock excess returns for the Japanese stock market. Contrary to this, Daniel *et al.* (2001) examined monthly data for stock returns listed on the Tokyo Stock Exchange from January, 1971 until December, 1997. They rejected the three-factor model in Tokyo in favour of a characteristic model.

Several studies, beginning with Basu (1977) have examined the relationship between the historical earnings yield for stocks and the returns on the stocks. Some have suggested that high earnings yield stocks will outperform low earnings yield stocks because growth firms enjoy high P/E ratios but the market tends to overestimate the growth potential and thus overvalues these growth firms while undervaluing low growth firms with low P/E ratios. A relationship between the historical earnings yield and subsequent return of market performance would constitute evidence against the semi-strong efficient market hypothesis because it would imply that investors could use publicly available information regarding earnings yield ratios to predict future abnormal returns.

Performance measures that consider both return and risk indicated that high earnings yield stocks experienced superior return results relative to the market whereas low earnings yield stocks had significantly inferior return results. Subsequent analysis concluded that publicly available earnings yield possessed valuable information regarding future returns which is inconsistent with semi-strong efficiency.

Ball (1978) stated that the E/P ratio could be pointed out as a direct proxy for expected returns. This is because the E/P ratio and the dividend price ratio constitute measures of yields that are likely to be correlated with true yields on common stock. Hence, the earnings yield is seen as an important variable that was believed could capture variances in stock returns when the CAPM model was considered inappropriate due to any anomalies and deficiencies.

Fama and French (1992) tested the capability of the earnings yield and size effect for the NYSE. They found that for the period 1963-1980, the earnings yield and size effect had relations with returns of common stock on the NYSE. Empirical tests also found that high E/P ratio firms had higher return compare to low earnings yield firms. The

earnings yield effect was clearly significant with the movement of stock returns across different sized firms. After measuring returns based on its size, the earnings yield effect was tested from a high earnings yield to a low earnings yield. Contrary to expectations, the size effect gradually disappeared when returns were controlled for differences in risk and earnings yield.

Lam (2002) stated in his study about the relationship between size, book-to-market equity ratio, earnings-to-price ratio and returns for the Hong Kong stock market and the three-factors could capture a cross-section of the stock returns, they are variable size, book-to-market ratio and earnings yield. Furthermore, he also tested other variables, such as leverage and formed other models to find the strengths for each variable. In his model which utilized market beta (β) and book-to-market ratio but the size effect was not represented by the book-to-market ratio due to its very low coefficient and that it was insignificant for that model. In addition, Lam (2002) formed a model that consisted of book-to-market ratio and earnings yield and found that a positive BE/ME return relation was consistent with Fama and French (1992), in that it could capture cross-sectional variations in stock returns. The earnings yield was also related positively and significantly to stock returns as consistent with Ball (1978)'s argument. Ball (1978) argued that if current earnings were used as a proxy for future earnings, high risk stocks with high expected returns would have low prices relative to their earnings for positive earnings yield firms only. Lam (2002) concluded that even though, book and market leverage could also be used to capture variation on stock returns, their effects are overpowered by the other three-factor which are size, book-to-market equity and earnings yield. Based on the above explanations, the following hypotheses are proposed:

H_1: There is a significant positive relationship between market excess returns and stock excess returns
H_2: There is a significant relationship between size and stock excess returns
H_3: There is a significant relationship between book-to-market ratio and stock excess returns
H_4: There is a significant relationship between earnings yield and stock excess return

MATERIALS AND METHODS

Data: Data on companies listed on the Bursa Efek Indonesia (BEI) for the period from 2006 until 2010 were collected from the DataStream database. A sample was chosen from public firms listed on BEI in the period from July, 2006 until June, 2010 (60 months). There were previously 424 firms registered on the BEI. Only 206 firms out of 424 were used due to incomplete data. Financial firms were excluded because of a different capital structure that would affect the results. The financial firms were firms that are involved in banks, consumer finance, full line insurance, investment services, reinsurance and speciality finance. Researchers employ the time-series regression approach of Black *et al.* (1972). In this case, time-series are used for regression because it gives direct evidence. The time series regression used excess returns (monthly stock returns minus the 1 month treasury bill rate) as the dependent variable. The monthly returns on stocks were regressed on the returns to a market portfolio of stocks, size, book-to-market equity (BE/ME) and earnings yield. The time-series regression slopes were the factor loadings so that those variables show a clear interpretation as risk factor sensitivities for stock.

For size, market capitalization is measured from small to big markets. For book-to-market, it is measured from low to high values. Moreover for the earnings yield, the data would be sorted from overrated stock is firm stock which is valued higher than it should be due to some reasons, such as investors perspective and market behavior to underrated stock is firm stock which is valued lower than it should be due to some reasons such as investors perspective and market behaviour. Then, the data were split into two size quintiles and three book-to-market quintiles. Six portfolios are constructed from the intersection of the size and BE/ME quintiles and were then calculated the value weighted monthly returns for the portfolios. The excess returns on these six portfolios for July, 2006 to June, 2010 is the dependent variable for stocks in the times series regression.

Dependent variables: Six portfolios (S/L, S/M, S/H, B/L, B/M and B/H) were constructed from the intersections of two size market capitalizations and the three book-to-market equity groups. For example, the S/L portfolio contains the stocks in the small market capitalization group that are also in the low book-to-market equity group and the B/H portfolio contains the large market capitalization stocks that also have high book-to-market equity. Monthly value weighted returns on the six portfolios were calculated in order to determine stock portfolio returns. For size, researchers used data for the month of June of year t. Meanwhile for the book-to-market ratio, researchers used Book Equity (BE) of financial year t-1 which is December for the Indonesian market and the Market Equity (ME) for the month of December of year t-1. Similar to the approach used by Fama and French (1993)'s study, negative values were not included in the data. The portfolio was constructed on July of year t until June of year t+1 and was reformed again on July of year t+1 based on the data, accordingly. For the market, the proxy for the market factor in stock

returns is the excess market return, R_M-R_F. R_M is the return in the value weighted portfolio formed from the intersection of size and BE/ME. For BE/ME, negative BE stocks are excluded from the portfolios. R_F is the 1 month interbank rate.

As the dependent variable in the time regression, this study used excess returns on all six portfolios. Portfolios were formed on size and BE/ME to determine whether they mimicked portfolio SMB and HML and captured common factors in stocks related to size and book-to-market equity. In addition, the earnings yield was also used to check whether it had the power to capture missing variations that were not explained by size and BE/ME.

Market excess return: Market return is measured by value-weighting of all stocks used in forming the six portfolios. In this study, the market excess returns of the six portfolios are used as dependent variables. Thus, the value-weighted returns of those six portfolios are used as the market return. Meanwhile, risk-free returns are measured by the interbank rate for Indonesian banks.

Size effect (SMB): Indonesian public firms listed on the Bursa Efek Indonesia (BEI) were divided into two groups of sizes based on the breakpoints for the top 50% and the bottom 50%. The top will be the smallest since, the data is sorted in an ascending manner.

For size, the portfolio SMB meant mimicking the risk factors in returns related to market capitalization which was the difference each month between the simple average of returns on the three small stock portfolios (S/H, S/M, S/L) and the simple average of the returns on the three big stock portfolios (B/H, B/M, B/L). Thus, SMB is the difference between the returns on the small and big stock portfolios with approximately the same weighted average book-to-market equity. This difference should be largely free of the influence of BE/ME, focusing instead on the different return behaviour of small and big stocks. Size is measured by taking the market value of the equity of firms. Market value of equity is defined as the total dollar market value of all of a firm's outstanding shares.

Book-to-market effect (HML): Indonesian public firms listed on the BEI are divided into three book-to-market equity groups based on the breakpoints for the bottom 30% (low), middle 40% (medium) and top 30% (high) of the ranked values of BE/ME for stocks.

For BE/ME, the portfolio HML meant to mimic the risk factors in returns related to book-to-market equity is similarly defined. HML is the difference each month between the simple average of the returns on the two high BE/ME portfolios (S/H and B/H) and the average of returns on the two low BE/ME portfolios (S/L and B/L). The two components of HML are returns on high and low BE/ME portfolios with about the same weighted average size.

The book-to-market ratio is the ratio formed from comparing the book value of equity to the market value of equity. Book value is taken from historical costs by looking at firms' accounting value. In addition, market value is assessed by the market price of a firms' stock or its market capitalization.

Earnings yield: Spread on earnings yield is believed to predict future returns on stock. Furthermore, studies also found the spread between earnings yield and interest rate also had the power to explain variations on stock returns for both long- and short-term. In this study, earnings yield are divided into three groups which are underrated, moderate and overrated. The division of data will be created by dividing total data by the three categories. The split follows Fama and French (1993) on dividing the firms based on their HML. In their study, it is stated that the split is arbitrary, however and researchers have not searched over alternatives. UMO is the underrated portfolio stock minus overrated portfolio stock. The data was sorted for July of year t based on earnings yield in June of year t and was reformed again on July of year t+1. Earnings yield is determined by dividing the earnings of firms at the end of a financial year with the price of a firm's stock.

Model specification and regression: The multiple regressions model that are used in this study are as follows:

Model 1: Three-factor model of Fama and French (1993) is:

$$R(t) - RF(t) = a + b\left[RM(t) - RF(t)\right] + sSMB(t) + hHML(t) + e(t)$$

Model 2: Three-factor model with additional variable (earnings yield):

$$R(t) - RF(t) = a + b\left[RM(t) - RF(t)\right] + sSMB(t) + hHML(t) + uUMO(t) + e(t)$$

Where:

R (t)-RF (t) = Stock excess return
RM (t)-RF (t) = Market excess return
SMB (t) = Small Minus Big
HML (t) = High Minus Low
UMO (t) = Underrated Minus Overrated

As can be seen in Fama and French (1993), it is expected market excess returns from the data to have a strong positive relationship with portfolio excess returns. Furthermore, the size effect would have a significant relationship toward the dependent variable and eventually BE/ME should also have significant positive relationship with portfolio excess returns. Furthermore in the second model which is with the additional variable, the E/P ratio should have a significant relationship with portfolio excess return.

RESULTS

Descriptive analysis: Table 1 reports the descriptive statistics of properties of the dependent variables. It shows that there are huge differences between small firm size and big firm size. The highest size value in small firms is Rp1,595.96 whereas the highest value in big firms is Rp95,996.07. In the same book-to-market quintiles, big size firms are 72 times bigger than small size firms. Meanwhile in the perspective of book-to-market equity, there is also quite a significant difference in big size firms. There is a range of >90% between big firms but only a range of 38% difference between small size firms.

Furthermore, there is a pattern in the average BE/ME except for low BE/ME. As shown in Table 1, BE/ME decreases from small firms to big firms. This pattern was also found by Fama and French (1993) for the US stock market. In addition, the number of firms in forming the portfolios does not have as much a difference. Moreover, for small size firms, the number of firms increased as the BE/ME became higher and decreased for big size. In big size firms, a high BE/ME had a smaller number of firms compared to the other two.

Table 1: Descriptive statistics of dependent variables properties

	Book-to-market quintiles		
Size quintiles	Low (L)	Medium (M)	High (H)
Panel A: Average of portfolio size (Rp)			
Small (S)	1,317.74	1,595.96	1,152.03
Big (B)	95,996.07	37,104.52	50,102.86
Panel B: Average of portfolio BE/ME			
Small (S)	0.29	1.05	7.16
Big (B)	0.35	1.00	3.91
Panel C: Average of number of firms in portfolio			
Small (S)	24.20	38.60	40.20
Big (B)	37.80	43.40	21.80
Panel D: Average of portfolio returns (%)			
Small (S)	14.05	3.21	6.40
Big (B)	3.24	3.53	2.30

The 6 size-BEME stock portfolios are formed from July year 2006 to June, 2010 of Bursa Efek Indonesia stocks. The portfolio is formed as follows. On July of every year, the stocks listed in BEI will be divided based on size and book-to-market equity. The stocks will be split into 2 quintiles of size and 3 quintiles of book-to-market equity. The 6 size-BEME stock portfolios are formed from the intersection of 2 quintiles of size and 3 quintiles of book-to-market equity. BEME is chosen for Indonesian listed firms in the month of December of year t-1 by excluding negative BEME. Size is chosen for Indonesian listed firms in the month of June of year t

Table 2 shows the descriptive statistics for the dependent variables that formed the six stock portfolios. As can be seen from Table 2, small firms with low book-to-market ratio (S/L) stock portfolios held the highest returns which were >14% where the other size and book-to-market ratio portfolios were <10%. This could be explained by the maximum and minimum returns. S/L reaches >200% returns for the period from 2005 until 2010. On the other hand on the minimum side, the value of S/L is more than -18%. Furthermore, stock portfolios on medium book-to-market ratio for both size firms (S/M, B/M) only showed a little difference for the period from 2005 until 2010. S/M and B/M had returns between 3 and 4% for their average returns. For the median, B/M had higher returns of >1.50% but for the maximum, S/M was far higher at around 11%. In addition, there are indifferent returns for the minimum side of both portfolios which were -19.37 and -19.44%, respectively. Even though, big firms were >22 times bigger than the small firms, data on indifferent returns for both portfolios showed that the average big size still outperformed small firms with very little returns. In addition, from both maximum and minimum, small firms were clearly beating big firms.

Other things that could be understood from the data were the standard deviation for the six stock portfolios. The lowest standard deviation fell in the intersection of big size and high book-to-market ratio (B/H), at 11.04%. Meanwhile, S/L had the highest standard deviation at >40. This thing could be explained by looking at the very large distances between the maximum and minimum returns for the S/L portfolio. In addition, the median for S/L only reached 1.81%. Big size and low book-to-market ratio (B/L) had a quite similar standard deviation with the small size

Table 2: Descriptive statistics of dependent variables (stock portfolio returns)

	Book-to-market quintiles		
Size quintiles	Low (L)	Medium (M)	High (H)
Panel A: Mean			
Small (S)	14.05	3.21	6.40
Big (B)	3.25	3.53	2.30
Panel B: Median			
Small (S)	1.81	2.00	2.64
Big (B)	2.94	3.91	2.31
Panel C: Maximum			
Small (S)	259.14	34.72	80.70
Big (B)	99.46	23.22	32.56
Panel D: Minimum			
Small (S)	-17.59	-19.38	-15.38
Big (B)	-28.99	-19.44	-31.26
Panel E: Standard deviation			
Small (S)	41.01	8.59	15.20
Big (B)	14.86	8.11	11.04

The 6 size-BEME stock portfolios are formed from July year 2006 to June, 2010 of Bursa Efek Indonesia stocks. The portfolio is formed as follows. On July of every year, the stocks listed in BEI will be divided based on size and book-to-market equity. The stocks will be split into 2 quintiles of size and 3 quintiles of book-to-market equity. The 6 size-BEME stock portfolios are formed from the intersection of 2 quintiles of size and 3 quintiles of book-to-market equity. BEME is chosen for Indonesian listed firms in the month of December of year t-1 by excluding negative BEME. Size is chosen for Indonesian listed firms in the month of June of year t

and high low book-to-market ratio (S/H) which were 14.86 and 15.20%, respectively. In spite of not much difference in the median and maximum return for both portfolios, S/H outperformed B/L on the minimum side where the difference was quite large (13.6%).

In conclusion, instead of having S/H stock portfolios that should perform the best and B/L stock portfolios that should perform the worst, researchers find that S/L portfolios outperformed most other stock portfolios and B/H did not perform well for the 5 years period.

Table 3 reports the descriptive statistics for the independent variables which are Market Excess Returns (MAR), Small Minus Big value weighted returns (SMB), High Minus Low book-to-market equity value weighted returns (HML) and Underrated Minus Overrated value weighted returns (UMO). The mean value for market returns was 2.42% where it is higher compared to HML and UMO. HML only reached -4.74% and UMO just reached -1.1%. This finding shows that high book-to-market ratio and underrated stock portfolios cannot outperform their counterparts. Meanwhile for SMB, small size seemed to outperform its counterparts by showing positive mean returns.

SMB showed a very high maximum return compared to other variables at >80%. This evidence presents the size effect which occurred many times in the Indonesian equity market where the minimum return for SMB is the lowest (-12.11%) of the variables that occurred in January, 2007. This indicated good results where it had been found in previous studies that small size firms have low earnings compared to big size firms. Contrary to this, HML showed weaker evidence in the Indonesian equity market where the maximum return only came to 23.67%. The worst return happened in January, 2010 when HML reached a level of -123.11%. Moreover, UMO showed an average range between maximum and minimum returns which was 14.49 and -20.72%, respectively.

Table 3: Descriptive statistic of independent variables

Variables	MAR	SMB	HML	UMO
Mean	2.42	4.86	-4.740	-1.11
Median	3.86	0.33	-1.289	-0.20
Maximum	18.55	85.11	23.670	14.49
Minimum	-27.22	-12.11	-123.140	-20.72
SD	7.39	16.25	21.170	8.29
Skewness	-1.07	2.92	-3.610	-0.40
Sum	145.46	291.58	-284.410	-66.41
Sum Sq. Dev	3226.14	15584.36	26453.020	4060.35
Observations	60.00	60.00	60.000	60.00

MAR is market excess return which is value-weighted of all stocks used in forming dependent variables minus risk free return. SMB (Small Minus Big) is average return on small size of portfolio stocks (S/L, S/M, S/H) minus average return on big size (B/L, B/M, B) that is formed on July of year t until June of year t+1. HML (High Minus Low) is average return on high book-to-market equity of portfolio stocks (S/H, B/H) minus low book-to-market equity of portfolio stocks (S/L, B/L) that is formed on July of year t until June of year t+1. UMO (Underrated Minus Overrated) is value-weighted on high earnings yield group of portfolio stocks minus value-weighted on low earnings yield group of portfolio stocks

Besides that as seen in Table 3, standard deviations were 7.39 and 8.29% for market excess return and UMO. This means that there was not much difference or deviation in the data. This is also supported by the maximum and minimum interval between market excess return and UMO which is quite close between the two variables. In addition, the standard deviation for HML is higher compared to SMB. HML has a much wider interval since, its minimum level reaches lower than -100% compared to SMB where its maximum returns is only 85.11%.

Coefficient analysis of stock return: From Table 4, the relationship between the dependent variable and the independent variables can be seen. Not surprisingly, the three-factor model can explain most all of dependent variables except for the B/M and B/H stock portfolios. Other dependent variables, show significant relationships with the Fama and French three-factor model for the period from 2005 until 2010.

As shown in Table 4, the beta for stock portfolio excess returns are all >4.5 for the standard error. The highest t-statistic for market excess returns is 11.52 for B/M. For the coefficients, S/H reached the highest at 1.043. This finding was also found in a study conducted by Bilinski and Danielle. Moreover, market excess returns show a significant positive relationship with stock excess returns for the six stock portfolios at a significance level of 1%.

Meanwhile for SMB, there are some exceptions for the B/M and B/H stock portfolios where it was not significant at all for this model. In addition, the t-statistic for SMB slopes are >4 times higher compared to market excess returns for S/L which was 14.38. The t-test shows the power of SMB in its shared capability of explaining variation of stock excess returns missed by market excess returns and HML. There are positive significant relationships at a 1% significance level for small firms but on the other hand there is a negative relationship at the 1% significance level for Big Firms (B/L). In addition, it was also found in Fama and French (1993) that the biggest size and the highest book-to-market ratio stock portfolios (B/H) were not significant.

The variable that was created to mimic returns for the book-to-market factor (HML) showed very good results indeed. Even though not all slopes were significant with a level of confidence >95%, still the results manifested the

Table 4: Regression of stock excess returns for market excess returns, size (SMB) and book-to-market equity (HML) R (t)-RF (t) = a+b [RM (t)-RF (t)]+sSMB (t)+hHML (t)+e (t)

	Book-to-market quintiles								
	Coefficient			t-test			Significant level		
Size quintiles	Low	Medium	High	Low	Medium	High	Low	Medium	High
Market excess return									
Small	1.04	0.73	1.04	6.12	7.22	6.46	0.00	0.00	0.00
Big	0.88	0.93	1.01	4.73	11.52	6.88	0.00	0.00	0.00
SMB									
Small	1.45	0.35	0.85	14.38	5.86	8.88	0.00	0.00	0.00
Big	-0.52	0.05	0.12	-4.78	1.02	1.41	0.00	0.31	0.16
HML									
Small	-0.94	0.16	0.50	-12.25	3.51	6.77	0.00	0.00	0.00
Big	-0.47	0.06	0.12	-5.54	1.70	1.76	0.00	0.09	0.08
Size quintiles	R^2			Durbin Watson			F^2		
Small	0.95	0.58	0.66	1.64	1.63	1.57	0.00	0.00	0.00
Big	0.53	0.70	0.46	1.46	1.52	1.66	0.00	0.00	0.00

good role of HML. The t-test showed an increase from the low book-to-market ratio to the high book-to-market ratio. This finding was also found by Fama and French (1993) where HML increased monotonically from strong negative values for the lowest book-to-market quintile to strong positive values for the highest book-to-market quintile. As seen in Table 4, the t-statistic for HML slopes moved from 1.69-1.76 then rapidly moved to 3.50. The highest t-test of HML reached >12. There was a negative significant value for the low book-to-market quintiles that corresponded with findings by Fama and French (1996) and Hardianto and Suherman (2009) where growth stock (low book-to-market ratio stock) had a negative significance. Moreover, B/M and B/H had a positive significant value at the 10% significance level.

Given the high slopes for the independent variables shown in Table 4, it is not surprising that an R^2 above 90% was found for the S/L portfolio. The lowest R^2 occurred in big firms except B/M. The values were only 46.30% for B/H and 53.23% for B/L, respectively. For B/H, this was caused by the insignificant variable SMB to explain the variation in stock excess returns. Meanwhile for B/L, it mostly is caused by capability of all significant variables in capturing stock excess return variation is not strong enough. For average, the model only could capture 64.81% of stock excess return. This means the other 35.19% of stock excess variation only could be explain by other variables excluded from model used.

For testing the significant level of market excess returns for SMB and HML simultaneously, F^2 was used. As shown in Table 4, probabilities for all six stock portfolios were 0.00. This is lower than the significant level of 1% and resulted in all independent variables being free from the influence of the dependent variables (stock excess return) at a 99% confidence level. Furthermore, the Durbin-Watson test was measured to indicate autocorrelation for the data. They ranged from 1.46 for B/L to 1.66 for B/H which means the data used had a very small positive correlation. But, this figure could not state that the data was highly positively correlated since they were not below 1. From this finding, it is concluded the data is suitable for this model. Multi-collinearity can be assessed by examining tolerance and the Variance Influence Factor (VIF). According to the results in Table 5, the results of VIF collinearity shows a value of <10 and a tolerance >0.1 which means there is no collinearity among the variables.

Table 5: Collinearity statistics for the three-factor model

	Collinearity statistic	
Variables	Tolerance	VIF
Market excess return	0.98	1.02
SMB	0.58	1.72
HML	0.58	1.72

The 6 size-BEME stock portfolios are formed from July year 2006 to June, 2010 of Bursa Efek Indonesia stocks. The portfolio is formed as follows. On July of every year, the stocks listed in BEI will be divided based on size and book-to-market equity. The stocks will be split into 2 quintiles of size and 3 quintiles of book-to-market equity. The 6 size-BEME stock portfolios are formed from the intersection of 2 quintiles of size and 3 quintiles of book-to-market equity. BEME is chosen for Indonesian listed firms in the month of December of year t-1 by excluding negative BEME. Size is chosen for Indonesian listed firms in the month of June of year t. MAR is market excess return which is value-weighted of all stocks used in forming dependent variables minus risk free return. SMB (Small Minus Big) is average return on small size of portfolio stocks (S/L, S/M, S/H) minus average return on big size (B/L, B/M, B) that is formed on July of year t until June of year t+1. HML (High Minus Low) is average return on high book-to-market equity of portfolio stocks (S/H, B/H) minus low book-to-market equity of portfolio stocks (S/L, B/L) that is formed on July of year t until June of year t+1. UMO (Underrated Minus Overrated) is value-weighted on high earnings yield group of portfolio stocks minus value-weighted on low earnings yield group of portfolio stocks

Given weak slopes for UMO and also insignificant results S/L, S/M, B/L and B/H, it is likely R^2 was not much affected by this new model. As shown in Table 6, R^2 increased for all stock portfolios from 0.05% for S/M to 5.50% as the highest increment for S/H. The slopes for UMO, mimicking the return for the earnings yield factor

Table 6: Regression of stock excess returns for market excess returns, size (SMB), book-to-market equity (HML) and earnings yield (UMO) R (t)-RF (t) = a+b [RM (t)-RF (t)]+sSMB (t)+hHML (t)+uUMO (t)+e (t)

	Book-to-market quintiles								
	Coefficient			t-test			Significant level		
Size quintiles	Low	Medium	High	Low	Medium	High	Low	Medium	High
Market excess return									
Small	1.00	0.73	0.94	5.65	6.89	5.86	0.00	0.00	0.00
Big	0.81	0.87	0.98	4.25	11.00	6.41	0.00	0.00	0.00
SMB									
Small	1.46	0.35	0.87	14.40	5.78	9.53	0.00	0.00	0.00
Big	-0.51	0.06	0.13	-4.66	1.33	1.48	0.00	0.19	0.14
HML									
Small	-0.93	0.16	0.52	-12.02	3.46	7.37	0.00	0.00	0.00
Big	-0.45	0.07	0.12	-5.36	2.10	1.85	0.00	0.04	0.07
UMO									
Small	-0.15	-0.01	-0.37	-0.97	-0.06	-2.57	0.34	0.95	0.01
Big	-0.23	-0.18	-0.11	-1.34	-2.60	-0.81	0.18	0.01	0.42
Size quintiles	R^2			Durbin Watson			F^2		
Small	0.95	0.58	0.70	1.69	1.64	1.76	0.00	0.00	0.00
Big	0.55	0.74	0.47	1.55	1.63	1.72	0.00	0.00	0.00

are systematically related to earnings-to-price ratio. Slope of UMO are only negatively significant for S/H and B/M stock portfolios at a 5% significant level.

Adding UMO to the regression showed a weaker role of market excess returns in affecting stock excess returns. As exhibited in Table 6, it decreased as much as 0.20% for the smallest, S/M and >10% for the highest with S/H. On the other hand, UMO was successful in increasing the role of SMB and HML in capturing stock excess return variations for the model.

For SMB, B/M increased >20% on its slope from only 0.049-0.06. For B/L, there was a drop of >2%. Even though, UMO could not help SMB to make the data significant for B/M and B/H, UMO was successful in escalating the confidence level to 81.18% for B/M and 85.52% for B/H but the data was still considered to be not significant for this model.

For HML, stock portfolios for a low book-to-market ratio showed a reduction of 1% for S/L and 3.1% for B/L, respectively. Meanwhile for other stock portfolios, there were enhancements of their role in describing stock excess return variations. The highest was achieved by B/M where the enhancement reached >15%.

For testing the significance level of market excess returns for SMB, HML and UMO simultaneously, the F^2 test was used. As shown in Table 6, probabilities of all six stock portfolios were 0.00. This is lower than the significant level of 1% and resulted in all independent variables being free from the influence of the dependent variables (stock excess return) at a 99% confidence level. Furthermore, the Durbin-Watson test shows that the autocorrelation for the data. They ranged from 1.54 for B/L and 1.75 for B/H which means the data became less positively correlated. From this finding, it is concluded the data is suitable for this model.

Table 7: Collinearity statistics for the four-factor model

	Collinearity statistic	
Variables	Tolerance	VIF
Market excess return	0.98	1.02
SMB	0.58	1.72
HML	0.58	1.72
UMO	0.91	1.10

The 6 size-BEME stock portfolios are formed from July year 2006 to June, 2010 of Bursa Efek Indonesia stocks. The portfolio is formed as follows. On July of every year, the stocks listed in BEI will be divided based on size and book-to-market equity. The stocks will be split into 2 quintiles of size and 3 quintiles of book-to-market equity. The 6 size-BEME stock portfolios are formed from the intersection of 2 quintiles of size and 3 quintiles of book-to-market equity. BEME is chosen for Indonesian listed firms in the month of December of year t-1 by excluding negative BEME. Size is chosen for Indonesian listed firms in the month of June of year t. MAR is market excess return which is value-weighted of all stocks used in forming dependent variables minus risk free return. SMB (Small Minus Big) is average return on small size of portfolio stocks (S/L, S/M, S/H) minus average return on big size (B/L, B/M, B) that is formed on July of year t until June of year t+1. HML (High Minus Low) is average return on high book-to-market equity of portfolio stocks (S/H, B/H) minus low book-to-market equity of portfolio stocks (S/L, B/L) that is formed on July of year t until June of year t+1. UMO (Underrated Minus Overrated) is value-weighted on high earnings yield group of portfolio stocks minus value-weighted on low earnings yield group of portfolio stocks

Multi-collinearity can be assessed by examining tolerance and the Variance Influence Factor (VIF). According to the results in Table 7, the results of VIF collinearity shows a value of <10 and a tolerance >0.1 which means there is no collinearity among the variables.

DISCUSSION

The purpose of this study is to investigate the relationship between market excess return, size and book-to-market ratio (Fama and French three-factor model) on stock returns. Furthermore, this study is also extended to add earnings yield to the Fama and French three-factor model and investigate its relationship to stock returns.

The samples are financial data taken from public firms listed in Burse Efek Indonesia (BEI). This study uses 206 out of 424 firms due to selected industries and unavailable data for the period 2005-2010. Thus, the sample represents about 48% of the BEI population. Selected industries were done by excluding financial firms such as banks, consumer finance, insurance, investment services and speciality finance due to very different capital structures. This study assists investors to predict movements on the equity market and helps prevent them from deriving negative returns since the main objective of investment is to realize positive returns over a given time of period.

Empirical analysis shows there are important factors that can be used as predictor of stock returns such as market excess return, size, book-to-market ratio and earnings yield (earnings-to-stock price). This study showed a highly positive relationship between market excess returns on stock excess returns. This means that market excess returns can affect stock excess returns to move accordingly to the level of market excess returns. This finding is consistent with Fama and French (1993) and Adrian and Franzoni (2009) who found a positive relationship between market excess return and stock excess return for the US equity market.

For size, both negative and positive relationships on stock excess returns were found. For big firms, it shows a negative relationship while small firms show a positive relationship toward stock excess returns. This finding was also found by Fama and French (1992) for the negative relationship and Keim (1983) for the positive relationship. This means that size could affect stock excess returns either way based on the economic conditions of a particular population.

For book-to-market ratio, both negative and positive relationships were also found in explaining stock excess returns. This finding was supported by Fama and French (1993), Chan *et al.* (1991) and Lewellen (1999) for the positive relationship and by Fama and French (1993) for the negative relationship for low book-to-market ratio. This evidence is somewhat found in this study where low book-to-market firms showed a negative relationship. For earnings yield, it was found that earnings yield had a negative relationship with stock excess returns. This finding was supported by Fama and French (1992) and Lewellen (1999).

Based on this study, investors are recommended to do analyses before purchasing a particular stock for their portfolio. As shown in this finding, first investors have to observe market conditions at any particular time. Market returns could affect stock returns positively and in the case of negative market returns, stock returns would be affected negatively. This condition will not offer investors optimal returns for their investments compared to positive conditions on market returns. Afterwards, firms' size should be considered before picking a stock. For small size firms, there is a positive relationship that will offer optimal stock returns for positive returns as small firms outperform big firms' returns. On the contrary, big firms show a negative relationship on stock excess returns where big firms will offer optimal positive returns compared to small firms.

The next step that should be carefully calculated is the book-to-market ratio of firms. Negative relationships appear for low book-to-market ratios which indicate that low book-to-market firms show higher returns compared to high book-to-market firms. Finally, earnings yield will ease investors' choices to decide on investments they have made. Earnings yield has a negative relationship for both big and small firms which means overrated firms' stock has higher earnings compared to underrated firms' stock.

For further studies, several areas can still be developed by adding more variables into the model. First, other fundamental variables could be used to make returns spread based on ranking. For example, further studies could take dividend yields and find the spread of returns by sorting increases in stock returns. Other fundamental variables are seen as important variables in predicting future stock returns. Second, a longer time period can also be applied in this time series study.

CONCLUSION

The findings in this study only correspond to a 5 years period from 2005-2010. Utilizing longer time periods and adding more variables will help the model to capture more variation on stock excess returns.

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