Fama-French Five-Factor Model Analysis on Valuation of Bank Stock Returns

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Abstract: The purpose of this study was to examine the ability of the Fama-French Five-Factor Model in providing explanatory power to banking stock excess returns on the Indonesia Stock Exchange. In examining the validity of the model, this study was conducted to determine how the influence of five factors consists of market risk, book-to-market ratio, market capitalization, profitability and investment in excess return of banking stock portfolio. The test in this study uses time series data by analyzing multiple linear regression for each portfolio that is formed based on the Fama-French five-factor model. The data used in this analysis are the daily average return of the bank's stock portfolio every month, the average daily market return every month, and the interest rate of Bank Indonesia Certificate as the rate for risk-free investments every month in the period from January 2012 to December 2017. The results show that the use of variable operating profit and investment gives anomalous results to banks that have a small market capitalization. But the use of variable operating profit and investment can provide a strong explanation of the optimism and pessimism of investors, especially in banks with a large market capitalization

1 INTRODUCTION

The valuation model that is well-known and widely applied in the world of capital markets is the Capital Asset Pricing Model (CAPM). This model is very popular since 1964 and researched separately by William Sharpe (1964), John Lintner (1965), and Mossin (1966). The CAPM model is portfolio theory development proposed by Markowitz (1952) by introducing a new term, namely systematic risk, and non-systematic risk. The risk measure used in CAPM is beta. Beta is used as a measure of the volatility of a security or portfolio return to market returns. In other words, beta estimation is done by collecting historical values of returns from securities and returns from the market within a certain period (Hartono, 2010). The concept of the relationship of β (systematic risk) with the return is explained by the security market line (SML). The relationship of expected return and risk lies in the SML line, with the main components of the CAPM including the risk-free rate of return, and the risk premium for securities. The simple calculation process and the ease of obtaining the required data is a special added value for the CAPM. However, over time the CAPM began to show its weaknesses. According

to Tandelilin (2003) the possibility of errors in the application of CAPM originating from beta changes according to the length of the observation period in the study, the market index used does not represent the entire marketable assets in the economy and the company's fundamental fluctuations such as earnings, cash flows, and leverage affect the beta value . Similarly, by looking at the real conditions of the market, the validity of CAPM is often questioned. In addition to the above, some other researchers also doubt the CAPM model which only uses beta as the only indicator of return assessment. They assume that there are other variables besides beta that can affect stock returns.

Fama and French (1992) have developed a stock pricing model by combining the Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT). This model is known as the Fama-French three-factor model where the variables consist of market risk used in CAPM, size and book-to-market ratio. Size is seen through the stock market capitalization value. The use of market capitalization as a factor is due to the difference between the risks in the stock and the small market capitalization which tends to have a higher risk

compared to stocks that have big capitalization so that stocks with small market capitalization have higher expected profit levels compared to stocks with big capitalization stocks. The use of book-to-market ratios as a factor due to the high book-to-market reflects investors who are pessimistic about the company's future. Conversely, if investors are optimistic about the future of the company, then the value of book-to-market will be low. According to Fama and French (1992) that these variables can explain the average stock returns in a cross section well. Likewise with other studies that have been carried out such as Liew and Vassalou (2000), Griffin and Lemmon (2002), Lettau and Ludvigson (2001, 2006), Tandelilin (2003), and Bello (2008). They have the same conclusions as for the results of the Fama and French research. Therefore, the Fama-French three-factor model has been used as a reference in the literature on asset pricing.

Fama and French (2015) added two factors in the asset pricing model to become five factors. Two factors added in the model are profitability and investment factors. The use of these two factors is based on the model used in Novy-Marx (2013) which gives the conclusion that higher returns tend to occur in companies that have high profitability compared to companies that have low profitability and the results of Aharoni et al. (2013) who found that there was a statistically significant relationship between proxy investment and the average rate of return. Fama and French (2015) use operating profit as a proxy for profitability and change in total assets as a proxy investment. In their research, Fama and French (2015) found that the five-factor model was better than the three-factor model in explaining stock excess returns in the United States. Likewise with other studies such as Chiah, et al. (2015) which compares the performance of Fama-French three-factor model and Fama-French five-factor model in the Australian stock market in the period January 1982 to December 2013 where the research found that the addition of profitability and investment provides explanatory power on market risk, profitability and investment factor and able to explain anomaly better than other asset pricing models

However, despite its success in some cases, there are also other cases that deviate from the discovery of Fama-French. Cakici (2015) using company-level data from July 1992 to December 2014, which forms size-to-market, size-gross profitability (GP) and size-investment. Cakici (2015) found that the HML factor (High Minus Low) or the difference in book-market stock portfolio returns is high with the low

book to market share portfolio strongly influential in all regions of the world, except North America. Profitability factor is only significant in Europe and the global market, but not for North America, Japan, and the Asia Pacific. Significant investment factors on Global, European and North American (slightly significant), but not significant in Japan and the Asia Pacific. These studies assume that the five-factor model of Fama-French is less able to adapt to every market situation in different regions and countries in the world.

Martins and Jr (2015) re-examined the performance of Fama-French three-factor and Fama-French five-factor by using data obtained from the Brazilian stock market in the period 2000-2012. The results of this study indicate that market risk, size, and Market-to-book ratios have the effect of most variations in average returns. While for the new variables which include profitability and investment have explanatory power that is still relatively weak, but still able to provide a better explanation than the Fama-French three-factor model.

Sutrisno and Ekaputra (2016) from Indonesia conducted research on Fama French Five Factors using secondary data obtained from Thomson Reuters Datastream during the period July 2000 to June 2015. The results concluded that the Fama-French five-factor model has the better capability in explaining the excess return of the stock portfolio in Indonesia compared to the Fama-French three-factor model, although profitability and investment factors have a weak effect on excess return. A significant intercept of empirical tests of Fama-French asset pricing models in Indonesia in every set of portfolios 25 indicates that the Fama-French model is invalid in Indonesia. With the addition of profitability and investment factors, the book-to-market factor is redundant in explaining the excess return of stock portfolios in Indonesia. This can be seen when the book-to-market factor is re-enacted with four other factors, the value of the intercept is near zero and insignificant. In conclusion, the findings in Indonesia support the findings of Fama and French (2015) in the US.

Elliot et al., (2016) presents a comprehensive ex-post analysis of Australian stock returns over the period 1975 to 2013. Using concentrated datasets with stocks showing high investment but low profits, the researcher suggests that additional factors such as profitability and investment are inconsistent and insignificant in explaining stock returns. While the market-to-book factor has a redundant power to the stock return. Huynh (2017) compared the ability of Fama-French three-factor to Fama-French five-

factor in explaining the profit opportunities obtained from the selection of several anomalies in the rate of return of Australian equity. The results obtained are the Fama-French five-factor model capable of explaining 16 anomalies from the 19 selected anomalies. So that the Fama-French five-factor model is considered better than the Fama-French three-factor. Where the market-to-book factor is very significant in explaining stock returns, the results of factor profitability and investment are very large and very significant, while the size factor is insignificant.

Estimating risk and stock returns are important for investors, so estimating with the Fama-French model is one way to predict and identify the movement of stock returns in the company. The effect of market risk, size, market-to-book, profitability, and investment on excess return has been widely studied in various countries' capital markets. However, in the Indonesian capital market itself, especially in the Indonesia Stock Exchange (IDX), research with the Fama-French model is still very limited. This research uses a sample of the banking stock population listed on the Indonesia Stock Exchange. The bank is a company that has more complex risks than other companies. The Fama-French five-factor model in which investment factors are included in the model is very suitable in this study because the Bank has a risk in investing in productive assets that are heavily influenced by market risk so that the decision in determining the number of assets is influenced by market risk. On the other hand, profitability is also influenced by the quality of assets that have asset quality due to market risk conditions at that time, because asset quality is influenced by market risk, indirectly profitability is also influenced by market risk. The regulation of the Bank's minimum capital limitation in financing assets is one of the factors that influence the expectation of higher excess returns so that the market capitalization has a link between profitability and bank investment, this variable also has an impact on the volume of stock sale transactions that occur where the large volume of stock sales will have an impact on the high or low book-to-market ratio so that the use of the Fama-French five-factor model is in accordance with the research using a sample of banks whose shares are traded on the Indonesia Stock Exchange.

2 METHODS

Fama and French (1992) suggested that the CAPM model that uses only single factor models cannot be market beta as a whole so that other factors are needed to complement market risk factors. The factors used to complete market risk are market capitalization (size) and market-to-book. Based on research conducted by Fama-French (1992) in looking at the effect of size on stock excess returns, each company is first divided into two groups: companies that have big market capitalization and small market capitalization where grouping is based on the median that has calculated the total market capitalization of the company. Grouping is divided into companies with a total market capitalization that are above the median into companies that have a big size (B), while companies with market capitalization that are below the median become companies that have small size (S). The same thing is done in grouping based on the market-to-book ratio. Furthermore, it is calculated the difference between stock returns with a big market capitalization (B) and small capitalization (S), the same thing is also done between stock returns with high (H) and low (L) book-to-market. In the formation of portfolios in independent variables, a grouping consists of 4 portfolios, namely companies with big market capitalization (B) and high book-to-market (H), companies with small market capitalization (S) and low book-to-market (L) and so on to become a portfolio of B / H, B / L, S / H, S / L. Each portfolio is calculated as excess return and regressed with the following equation:

$$R_t - Rf_t = \alpha + \beta 1 \ (Rm_t - Rf_t) + \beta 2 \ (SMB_t) + \beta 3 \ (HML_t) + \mu \ \text{.......................................(1)}$$

Where R_t is stock portfolio return, Rf_t is the return of historical risk-free assets, Rm_t is historical market return, SMB_t is the difference between the return of stock portfolio with small market capitalization and return of stock portfolio with big market capitalization, HML_t is the difference between the return of stock portfolio with high B/M and return of stock portfolio with low B/M.

This study uses the Fama-French five-factor model by entering the profitability and investment variables in which the grouping of banks that have robust (R) and weak (W) profitability and banks that have conservative (C) and aggressive (A) investments are the same as the groupings used in size and book-to-market. Furthermore, the excess return difference between banks that have robust operating profitability and weak is sought (robust minus weak), the same thing is also done to find

excess returns between banks that have conservative and aggressive investments (conservative minus aggressive). The five-factor model is formulated in the following equation:

$$R_t - Rf_t = \alpha + \beta 1\ (Rm_t - Rf_t) + \beta 2\ (SMB_t) + \beta 3\ (HML_t) + \beta 4\ (RMW_t) + \beta 5\ (CMA_t) + \mu$$
..........(2)

Where R_t is the daily average return of the bank's stock portfolio every month, Rf_t is a risk-free investment return, SMB_t is the difference between the return of a stock portfolio with a small market capitalization and the return of a stock portfolio with a big market capitalization, HML_t is the difference between the return of a bank's stock portfolio with high book-to-market and low return on stock portfolios with book-to-market, RMW_t is the difference between the bank's stock return portfolio and high operating profitability (robust) and return stock with low (weak) operating profitability, CMA_t is the difference between returns return the bank's stock portfolio with conservative investment and return on stock portfolios with aggressive investments.

The population in this study were all banks listed on the Indonesia Stock Exchange (IDX) in the period 2012 to 2017. The samples in this study were selected from the entire population using purposive sampling method with criteria for banks listed on the Indonesia Stock Exchange from January 2012 to December 2017 and publish financial statements. Based on these criteria, the samples taken were 28 banks with a period of 6 years. Banks that are sampled in this study are presented in Table 1:

Table 1: Research Sample

No	Stock Code	Bank Name
1.	AGRO	Bank Rakyat Indonesia Agroniaga Tbk
2.	BABP	Bank MNC Internasional Tbk.
3.	BACA	Bank Capital Indonesia Tbk
4.	BBCA	Bank Central Asia Tbk
5.	BBKP	Bank Bukopin Tbk
6.	BBNI	Bank Negara Indonesia Tbk
7.	BBRI	Bank Rakyat Indonesia (Persero) Tbk
8.	BBTN	Bank Tabungan Negara (Persero) Tbk
9.	BDMN	Bank Danamon Indonesia Tbk
10.	BEKS	Bank Pembangunan Daerah Banten Tbk.
11.	BJBR	Bank Pembangunan Daerah Jawa Barat dan Banten Tbk
12.	BKSW	Bank QNB Indonesia Tbk

13.	BMRI	Bank Mandiri (Persero) Tbk
14.	BNBA	Bank Bumi Arta Tbk
15.	BNGA	Bank CIMB Niaga Tbk
16.	BNII	Bank Maybank Indonesia Tbk
17.	BNLI	Bank Permata Tbk
18.	BSIM	Bank Sinarmas Tbk
19.	BSWD	Bank of India Indonesia Tbk
20.	BTPN	Bank Tabungan Pensiunan Nasional Tbk
21.	BVIC	Bank Victoria International Tbk
22.	INPC	Bank Artha Graha Internasional Tbk
23.	MAYA	Bank Mayapada Internasional Tbk
24.	MCOR	Bank China Construction Bank Indonesia Tbk
25.	MEGA	Bank Mega Tbk
26.	NISP	Bank OCBC NISP Tbk
27.	PNBN	Bank Pan Indonesia Tbk
28.	SDRA	Bank Woori Saudara Indonesia 1906 Tbk

Before testing the hypothesis in this study, we formed a stock portfolio of 28 Bank samples using models such as Fama and French (2015) with sorts of 2 x 2 x 2 x 2 on size, book-to-market, operating profit and investment consisting of portfolios : 1) S/H//R/C; 2) S/H/R/A; 3) S/H/W/C; 4) S/H/W/A; 5) S/L/R/C; 6) S/L/R/A; 7) S/L/W/C; 8) S/L/W/A; 9) B/H/R/C; 10) B/H/R/A; 11) B/H /W/C; 12) B/H/W/A; 13) B/L/R/C; 14) B/L/R/A; 15) B/L/W/C; 16) B/L/W/A. Where S is a bank that has small market capitalization, B is a bank that has big market capitalization, H is a bank that has high book to market, L is a bank that has low book to market, R is a bank that has robust operating profitability and a bank that has weak operating profitability, C is a bank that has conservative investment and A is a bank that has aggressive investment. By using the Fama and Fench (2015) model, the determination of the dependent and independent variables in this research are:

1) Dependent variables: The dependent variable used in this study is the excess return of each bank's stock portfolio that has been formed as the pattern specified above. After forming a portfolio, the excess return for each portfolio is calculated monthly with the formula: Rit - Rft. Where Rit is the average daily portfolio return every month and Rft is the Bank Indonesia rate (BI Rate) every month.

2) independent variable: the independent variable used in this study consists of:
   a) SMB (Small Minus Big) is the difference in average returns on eight

stock portfolios with small market capitalization and average return on eight stock portfolios with big market capitalization. Grouping portfolios in banks by categorizing shares with 50 percent market capitalization below, and 50 percent market capitalization. The market capitalization used to classify shares in forming a portfolio each year is market capitalization at the end of December t-1 adjusted for changes in the number of shares outstanding at the end of December. The SMB equation above is as follows: *SMB = (S/H/R/C + S/H/R/A + S/H/W/C + S/H/W/A + S/L/R/C + S/L/R/A + S/L/W/C + S/L/W/A)/8 – (B/H/R/C + B/H/R/A + B/H/W/C + B/H/W/A + B/L/R/C + B/L/R/A + B/L/W/C + B/L/W/A)]/ 8.*

b) HML (High Minus Low) is the difference between the average return of eight stock portfolios with a high book to market ratio and the average return of eight stock portfolios with a low book to market ratio based on the proportion of 50 percent stock portfolio formation for the lowest group (Low), and 50 percent for the highest group (High). The book equity used to classify shares in forming a portfolio each year is book equity at the end of December t-1 while the market capitalization class is the same as the above classification of SMB. HML equation as follows: *HML =(S/H/R/C + S/H/R/A + S/H/W/C + S/H/W/A + B/H/R/C + B/H/R/A + B/H/W/C + B/H/W/A)/8 – (S/L/R/C + S/L/R/A + S/L/W/C + S/L/W/A + B/L/R/C + B/L/R/A + B/L/W/C +B/L/W/A)/ 8*

c) RMW (Robust Minus Weak) is the difference in the average return on eight stock portfolios that have a high operating profitability value with an average return on eight portfolios that have a low operating profitability value by classifying operating profitability based on the proportion of 50 percent for the highest group (robust) and 50 percent for the lowest group (weak). Profitability used to classify shares in forming a portfolio each year is profitability at the end of December t-

1. RMW equation as follows: *RMW = (S/H/R/C + S/H/R/A + S/L/R/C + S/L/R/A + B/H/R/C + B/H/R/A + B/L/R/C + B/L/R/A)/8 – (S/H/W/C + S/H/W/A + S/L/W/C + S/L/W/A + B/H/W/C + B/H/W/A + B/L/W/C + B/L/W/A) / 8*

d) CMA (Conservative Minus Aggressive) is the difference between the average return of eight stock portfolios that have high investment value with the average stock portfolio return which has low investment value by classifying investments based on the proportion of 50 percent for the lowest group (Aggressive), and 50 percent for the highest group (Conservative). The investment used to classify shares in forming a portfolio every year is an investment at the end of December t-1. CMA equation as follows: *CMA = [(S/H/R/C + S/H/W/C + S/L/R/C + S/L/W/C + B/H/R/C + B/H/W/C + B/L/R/C + B/L/W/C) – (S/H/R/A + S/H/W/A + S/L/R/A + S/L/W/A + B/H/R/A + B/H/W/A + B/L/R/A + B/L/W/A)] / 8*

The data analysis technique used is multiple linear regression with time series data with a total of 72 months by regressing each independent variable with the excess return of each portfolio with the following equation (2) above.

3 RESULTS AND DISCUSSION

In providing a better explanation of the four factors that affect the excess return of the banking stock portfolio, this study first calculates the daily average portfolio return every month in the period January 2012 to December 2017 based on 4 factors consisting of size, book-to-market, profitability, and investment so that it can be seen that there is an interaction between one independent variable and another in generating the average return. The results of this calculation form the pattern presented in Table 2:

Table 2: Average Monthly Return

	SMALL			BIG	
Panel A: Portfolios formed on Size, B\M, and OP					
BM - OP	Low	High	BM - OP	Low	High
Weak	0,098532605	0,096717688	Weak	0,00110632	0,079167346
Robbust	0,024253104	0,112961814	Robbust	0,109187549	0,035156446
Panel B: Portfolios formed on Size, B\M, and INV					
BM - INV	Low	High	BM - INV	Low	High
C	0,104347639	0,025817714	C	0,085381856	0,049012753
A	0,064574786	0,179566293	A	0,130575745	0,045492338
Panel C: Portfolios formed on Size, OP, and INV					
OP - INV	Weak	Robust	OP - INV	Weak	Robust
C	0,109339544	0,032072755	C	0,095770909	0,047866479
A	0,103656714	0,151978564	A	0,039605228	0,068368644

The average bank stock return with small market capitalization shows that the average stock return that has robust profitability give higher return if book-to-market gets higher. But if the Bank has low profitability it does not show the difference in the average significant return between low or high book-to-market conditions. These results indicate that there are pessimistic investors in banks with a small market capitalization that provides weak profitability. If we look at the relationship between book-to-market and investment, it shows the negative relationship in generating high average returns, where high book-to-market with aggressive investment gives a high average return and if low book-to-market with conservative investment also gives a high average return. The results show that investors are optimistic that banks have low market prices to make aggressive investments and high market prices to make conservative investments. If we look at the relationship between profitability and investment in generating average returns, it indicates that banks that have robust operating profitability and aggressive investments provide average higher return while robust operating profitability with conservative investment provides a lower average return. When the Bank is in a condition of having weak operating profitability, there is no difference in the average significant return in the conservative and aggressive investment conditions. These results indicate investors are optimistic about banks that have robust profitability to invest aggressively.

The average stock return of banks that have big market capitalization shows high average return if the Bank has low book-to-market with robust profitability but provides an average low return if weak profitability. In the low book-to-market condition there is no significant difference in the average return between banks which provide robust and weak profitability. These results indicate that investors are optimistic about banks with big market capitalization to have high book-to-market and robust operating profitability. Likewise, with investments where banks that have low book-to-market will have an average high return if the investment is aggressive but will provide an average low return if the investment is conservative. These results indicate that investors are optimistic that banks have low book-to-market to invest aggressively. In looking at the average return generated in terms of the relationship between operating profitability and investment shows a significant difference, so this result shows that relation between operating profitability and investment provide more explanatory power to the average return on companies that have big market capitalization. The results from Table 2 show that operating profitability and investment provide a strong explanation for the average bank stock return which has big and small market capitalization.

Before conducting multiple linear regression analysis on time series data, a classic assumption test consisting of multicollinearity test and autocorrelation test is needed as presented in Table 3

Table 3: Classic Assumption Test

Variables	S/H/W/C	S/L/W/A	S/L/W/C	B/H/R/C	B/H/R/A	B/L/R/A
Multicollinearity VIF Test						
Market_Risk	1.209448	1.209448	1.209448	1.209448	1.209448	1.209448
SMB	2.100896	2.100896	2.100896	2.100896	2.100896	2.100896
HML	5.755024	5.755024	5.755024	5.755024	5.755024	5.755024
RMW	2.100896	2.100896	2.100896	2.100896	2.100896	2.100896
CMA	4.147844	4.147844	4.147844	4.147844	4.147844	4.147844
Autocorrelation LM Test						
F-statistic	1.282655	0.826855	0.206897	0.826855	0.206897	1.282655
Prob. F(2,65)	0.2842	0.4420	0.8136	0.4420	0.8136	0.2842
R-squared	2.733685	1.786354	0.455456	1.786354	0.455456	2.733685
Prob Chi-Square	0.2549	0.4094	0.7963	0.4094	0.7963	0.2549

Multicollinearity testing results in a perfect correlation between SMB and RMW variables so that the multicollinearity test between SMB and RMW variables is done separately by doing two tests, namely multicollinearity testing between variables using the SMB variable and take out the RMW variable, then doing multicollinearity testing again with enter the RMW variable and take out SMB variable so that there is no multicollinearity. The autocorrelation test results using the Langrage Multiplier test (LM-Test) where the results show no Prob. Chi-Square (2) is below 5 percent so it can be said that autocorrelation does not occur for each portfolio.

In this study, each portfolio was regressed twice by using the SMB and RMW factors alternately. This is done because of the problem of multicollinearity between SMB and RMW. The influence of five independent variables (market risk, size, a book to market ratio, operating profitability, and investment) on the dependent variable namely excess return for each portfolio from January 2012 to December 2017 was tested using time series data are presented in Table 4:

Table 4: Fama-French Five-Factor Model for Each Portfolio

Variables	S/H/W/C	S/L/W/A	S/L/W/C	B/H/R/C	B/H/R/A	B/L/R/A
Market_Risk	41.0618***	22.118***	43.549** *	22.118***	43.549**	41.061**
SMB	16.1489***	1.8923*	-0.439	-8.770**	-0.439	-4.434** *
HML	8.1896***	-1.215	-9.872***	-1.215	2.371**	-2.781**
RMW	-16.148**	-1.8923*	0.439	8.770**	0.439	4.434**
CMA	0.7260	2.000**	12.640** *	9.391**	-3.281**	0.726
Adj. R^2	0.968	0.886	0.971	0.960	0.970	0.967
F value	549.31** *	139.51***	600.14** *	428.85***	583.794***	527.926***

***,**, and * indicate statistical significance at 1, 5 and 10 percent, respectively.

Market risk has a positive effect on the excess return of all portfolios where this result shows that the market risk variable is a systematic risk that has a very strong impact on the banking industry in Indonesia. Market capitalization (SMB) has positive and significant effect on the S/H/W/C portfolio excess return but has negative and insignificant effect on the S/L/W/C portfolio excess return, then market capitalization (SMB) has a negative and significant effect on B/H/R/C and B/L/R/A portfolio excess returns. These results indicate that market capitalization cannot show an explanation of the Bank's excess return in Indonesia by using a 2 x 2 x 2 x 2 pattern where the research was previously Fama and French (2015), Martins and Jr (2015), and Huynh (2017) Using portfolio formation with a pattern of 2 x 2 and 2 x 3 can show a significant explanation of the effect of market capitalization (SMB) on excess return. The use of patterns in this study shows anomalies where the effect of market capitalization is positive on S/H/W/C portfolio excess return and negative on the B/H/R/C and B/L/R/A portfolio excess return which are not suitable as presented in Table 2.

The anomaly results also occur in the analysis of book-to-market influence on excess returns which shows a positive and significant effect of book-to-market (HML) on S/H/W/C portfolio excess return and negative and significant effect on portfolio excess return S/L/W/C where Table 2 shows that S/L/W/C portfolio should provide a higher average return compared to the S/H/W/C portfolio. The results of this anomaly are in accordance with the conclusions of Fama and French (2015) that the addition of variable operating profit and investment provides anomalies caused by the existence of small companies that invest aggressively with low operating profit so that high investments made in the company become a problem in research.

But the pattern of 2 x 2 x 2 x 2 in this study can explain that the effect of operating profit and investment on the excess return of the Bank's portfolio in Indonesia. These results are shown in Table 4 where operating profit has a positive and significant effect on excess return portfolio B/H/R/C and B/L/R/A. These results indicate that the pattern of 2 x 2 x 2 x 2 can show that operating profit explains the relationship between book-to-market and investment where banks that have high book-to-market and conservative investments give the same results as banks that have a low book-to-market and aggressive investment in large banks if the operating profit condition is robust. But the results that occur in small banks cannot provide an explanation for the book-to-market relationship with investment. These results reinforce the same conclusion from Fama and French (2015) which has been stated that small companies with small profits carry out high investment actions so as not to influence investors' optimism.

The influence of investment presented in Table 4 can also explain the reciprocal relationship between market capitalization, book-to-market and operating profit where investment has a positive and significant effect on the excess return on the S/L/W/C and B/H/R/C portfolios. These results indicate that investors prefer small banks that have low book-to-market but produce weak operating profit and large banks that have high book-to-market but generate robust operating profit to invest conservatively. These results can provide an explanation that the pattern of 2 x 2 x 2 x 2 used in this study can better explain that investment can provide a pessimistic and optimistic relationship between investors through conservative investments by banks compared to previous studies that applied 2 x 2 and 2 x 3 patterns.

4 CONCLUSION

This study is to test the five-factor model developed by Fama-French (2015) on banks listed on the Indonesia Stock Exchange. This research was conducted because there are still not many studies that use the Fama-French five-factor model to test its

validity in Indonesia. The use of banks as samples in this study is because banks have assets that are riskier than other companies and the management of banks in generating profits is a factor that is very much considered by investors so that it is more suitable in testing operating profit and investment factors used in Fama-French five-factor model.

The pattern used for the formation of portfolios using 2 x 2 x 2 x 2 is rarely done by previous research with the intention of operating profit factors and investment can provide explanatory power that can influence other factors on excess return. The application of this pattern provides anomalies in testing market capitalization and book-to-market factors. But this pattern can explain that investors are pessimistic and optimistic about large banks in investing in terms of the operating profit they have. The results show investors like a high investment if they generate high profits and low investment if profits are low. But this relationship does not occur in banks that have small assets due to the high investment made by small banks even though the resulting profits are low so there is an anomaly in the results of this study

The results obtained from testing the portfolio of small banks provide anomalies in testing the factors of market capitalization, book-to-market, and operating profit, giving a finding that investors prefer small banks to invest low in their assets. This result is reinforced by the results of the test of the effect of the investment on excess returns where investors are optimistic about small banks that make conservative investments if their book-to-market has a low.

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