Do Firm Size and Value Affect Shareholder Returns in Malaysia?

Pheng Bian Ong[1], Mohamed Hisham Hanifa[1*] & Mansor Mohd Isa[1]
[1]*Faculty of Business and Accountancy, University of Malaya, Malaysia.*

Abstract: Hundreds of empirical studies have documented the presence of stock market anomalies that allow investors to possibly take advantage of the inefficiency of the stock. The most common anomalies pointed out by the previous studies are the presence of size and value anomalies. Using Fama and French's three-factor asset pricing model, we make an initial attempt to investigate the presence of these anomalies for firms listed on Bursa Malaysia. Our sample consists of 500 public listed stocks from July 2005 to December 2015. We employ multiple regression, which has resulted in three major findings. Firstly, our results provide stronger support for Fama and French's three-factor model as compared to the single factor. Secondly, small firms generate extra returns as compensation for the size risk premium, and, finally, high value firms yield a better return, which is contributed by the additional value risk premium as a result of increased distress.
Keywords: Fama and French's three-factor model, capital asset pricing model, CAPM, size effect, value effect.
JEL Classifications: G120, G110

1. Introduction

It is well understood that stock market risks can broadly be broken into two main categories, which are market risks and firm specific risks. The unsystematic portion, i.e., firm specific risks, can be easily mitigated by spreading the risk into different investments through a diversified portfolio, so that not all the eggs are put in one basket (Markowitz, 1952). After eliminating the firm specific risks, the only relevant risks in a portfolio investment should be the market risks in a free market environment. Based on Markowitz's framework, Lintner (1965), Mossin (1966) and Sharpe (1964), found that market risk premium is the only important factor that affects the stock returns, and suggested the use of the capital asset pricing model (CAPM) for the estimation of expected returns. This model has since been widely applied and has become the most popular asset pricing model among others.

Evolving from previous empirical studies, some findings have suggested that the single factor CAPM is not such a conclusive model as previous studies found that market risk has very minimal correlations with the stock returns (Breeden *et al.*, 1989; Chui and Wei, 1998; Fama and French, 1992; Lam, 2002; Reinganum, 1981). In light of the weak market risks and stock returns relationship, some studies provided evidence of the relationship between stock returns and other non-market factors, such as size represented by market capitalization (Banz, 1981; Blume and Stambaugh, 1983; Brown *et al.*, 1983; Reinganum, 1981), and value represented by book-to-market equity (BE/ME) (Basu, 1977; Davis, 1994; Rosenberg *et al.*, 1985). These two non-market risk premia were widely known as stock market anomalies that caused the single factor CAPM to be less applicable. The previous empirical studies seemed to generally accept the presence of size anomalies and agree to their impact on the stock

[*] Corresponding author: Mohamed Hisham Hanifa. Email: mhisham@um.edu.my
Received 26 July 2018; Accepted 12 November 2018; Available online 29 January 2019.

returns. However, the capability of value risk premium in predicting stock returns remains inconclusive.

In this light, Fama and French developed a three-factor model, which includes the two above mentioned risk premia, size and value, to better explain the variation of average stock returns (Fama and French, 1993, 1995, 1996, 1998). This model has been widely tested in the stock markets of the United States by Fama and French themselves as well as other researchers, who found it to be inconclusive, mainly due to survivor bias and data snooping. Adding robustness to Fama and French's validation of their model using data from different international markets (Fama and French, 1998), this research aims to answer the arguments concerning data snooping and survivor bias by extending the Fama and French study into a non-US market, i.e., Malaysia, thus, in addition to shedding light on the sample specific problem, the data source issue would be solved (Barber and Lyon, 1997; Campbell *et al.*, 1997).

Hence, the focus of this research is three-fold, as follows;

a. identify the applicability of Fama and French's three-factor pricing model in the Malaysia stock market context and compare it with the capital asset pricing model (CAPM) for predicting stock returns;

b. determine whether smaller size firms will generate higher stock returns than the larger firms; and

c. establish whether firm's with higher value will generate higher stock returns than lower value firms.

In addressing the issue of the size and value anomalies in the Malaysian context, this study covers a total of 500 stocks listed on the Main Market of Bursa Malaysia excluding stocks from the financial industry for the period from July 2005 to December 2015 (126 monthly stock returns). Subsequently, the 126-monthly data were then broken into two (2) sub-periods: (i) between July 2005 and December 2010, and (ii) between January 2011 and December 2015. This sub-period study was added to capture the consistency of the presence of the size and value effect during the Global Financial Crisis (GFC). Hence, any variations in the findings between these sub-samples would be attributed to the differences in the size and value effects during the crisis years (Global Financial Crisis in 2008 and 2009[1]) versus a period of normal years.

Using Multiple Linear Regression, the study found three significant findings, firstly the applicability of Fama and French's three-factor pricing model in the Malaysian stock market context, secondly, firms with smaller size will generate higher stock returns than the larger firms in Malaysia, and, finally, firms with higher value will generate higher stock returns than the lower value firms in Malaysia. These findings also remain consistent in the period of crisis.

The research findings contribute to the understanding on the applicability and validity of different asset pricing models in the Malaysian context. Thus, the study highlights that the presence of size effect causes stocks of smaller firms to yield higher returns compared to those of big firms; hence, market capitalization could be an indication used by the investors when looking for their investment opportunities. In addition, the value of the stocks could be another consideration during the construction of the investment portfolio. In this aspect, stocks with

[1] The Global Financial Crisis happened during the year 2008 and 2009 and had a tremendous impact on the world economy. The crisis started with an asset bubble attributed to a series of financial derivatives transactions, which then led to a rise in the sub-prime mortgage in the United States. The sub-prime mortgage boom subsequently developed into a housing crisis and financial crisis, which caused the US economy to collapse. The contraction of the US economy badly hit the export-dependent economies, such as Malaysia, in at least two ways: (1) the slowdown in exports, and (2) the contraction in foreign direct investments (FDIs) (Zainal Abidin and Rasiah, 2009).

high value would have higher chances of earning excess returns than the lower value ones due to their risky nature.

The remainder of this paper is organized as follows: In Section 2, the literature review is mainly on corporate financing followed by Section 3 on the data set and methodology. In Section 4, we present analyses of the data and report results based on CAPM and the Fama French model, for both full period and sub-period analysis. Lastly, in Section 5, we summarize the main conclusions and offer suggestions for further research.

2. Literature Review

2.1 The Theoretical Underpinnings of the Efficient Market Hypothesis

The theory of Efficient Market Hypothesis (EMH), developed back in the 1960s by Eugene Fama, depicted that stock prices always instantaneously reflect all the past and current information made available to the market; therefore, no one could possibly take advantage over the investment in assets that is mispriced due to the market inefficiency (Fama, 1965). Investors could not outperform the market return in this random walk environment (Fama, 1965). The chartists and security analysts who are inclined to identify the mispriced assets through various market analysis techniques will be wasting their time and effort in finding out the undervalued or overvalued stocks. The outperforming market return may only be achieved by chance, that is, buying and holding the stock for long term capital gain. Therefore, it was believed that there was no way for the investors to arbitrage any mispricing opportunity in an efficient market.

Fama and French (1995, 1996, 1998), in their several studies, have also acknowledged the presence of the value effect depicted by their three-factor asset pricing model. The three-factor asset pricing model not only comprises (1) the traditional factor, i.e., excess market portfolio, but also the excess return attributed to (2) the Size Effect – the difference between the return of small stocks and that of big stocks, and (3) the Value Effect – the difference between the return of high book-to-market stocks and that of low book-to-market stocks. This model is said to have "cured" most of the market anomalies of the single factor asset pricing model, CAPM (Fama and French, 1996). More recently, studies on Fama and French's asset pricing model also extended into five and six-factor models that include the momentum factor (see Barillas and Shanken; 2018) and the labor search friction factor (see Kuehn et al. 2017).

The Fama and French model was also tested in Malaysia by several researchers. However, the results seem to be mixed and inconclusive with most of the studies designed to test either a specific industry or a short study period (Abdul-Rahim, 2007; Abdul-Rahim and Mohd Nor, 2006; Al-Mwalla and Karasneh, 2011; Drew and Veeraraghavan, 2002; Drew and Veeraraghavan, 2003; Lai and Lau, 2010; Monfared and Wasiuzzaman, 2012).

Interestingly, the controversies arising from these findings motivates the need for this research. Specifically, the present study would like to add insights concerning the presence of the size and value anomalies in the Malaysian market using a larger sample size and longer study period.

2.2 Size and Value Effects in Predicting Average Returns

Although the size and value anomalies were identified by various researchers in their previous studies, they were not independent from each other simply because the same variable was used in identifying the size and value effects. An individual stock price of a firm is the main variable used in determining the market capitalization (market price multiplied by number of stocks) and the book-to-market (book value divided by market value). Researchers have evidenced the statistically significant positive correlation between size and price per share as well as between the book-to-market and price per share. Some researchers even documented the positive cross-sectional correlation between market price per share and the stock returns.

In their 1993 paper, Fama and French provided an explanation concerning the variances between the returns on the New York Stock Exchange (NYSE) and the National Association of Security Dealers (NASD), whereby given the similar firm size, stocks on the NYSE yielded better average returns than the stocks on the NASD during their research term. They documented in their paper that the variations of the stock returns could be explained by the other risk factor in their three-factor pricing model, which is the value effect. They provided the argument that stocks that yielded better returns tended to be firms that earn poor profits persistently, which, in turn, caused the stock price to fall, and, therefore, the book-to-price ratio was then increased. In contrast, firms that consistently made good profits could be those that had lower average stock returns due to the higher book-to-price ratio. This was how they threw out the most important risk factor that explained the variation of stock return between the NYSE and NASD for stocks of similar size.

Another analysis was done by Fama and French in 1995 to test the three factors identified in their 1992 work using the three-factor model. The results provided consistent evidence that the persistent poor earnings of a firm would be associated with high BE/ME and vice versa. High BE/ME stocks would have high average returns because the expected income growth would be lower than the actual earnings, and low BE/ME stocks would have lower actual earnings than the expected growth. This also contributed to the knowledge that the BE/ME may be a proxy for distress. Low BE/ME (a high market price relative to book value) normally corresponds to firms with high average returns on capital (growth stocks), whereas high BE/ME (a high book value relative to the market value) is associated with firms that are relatively distressed (Fama and French, 1995).

With the introduction of the Fama and French model in 1993, several arguments were raised querying the framework. Numerous researchers rejected the explanation of Fama and French (1993) concerning the sources of two additional risk premiums other than the market risk premium. Although the size effect is considered to be straightforward, some studies expressed strong doubts concerning the ability of the size and BE/ME value in explaining stock returns and believed that the effects were not persistent. For example, some researchers claimed that the value effect was present because the investors over anticipated the past performance of the stock, thus causing them to overvalue a high BE/ME stock or undervalue a low BE/ME. Thus, when the mispricing was adjusted back to equilibrium, one would witness that the distressed (value) stocks would generate higher returns and the growth stocks would only yield low returns (DeBondt and Thaler, 1987; Haugen, 1995; Lakonishok *et al.*, 1994). From another perspective, Daniel and Titman (1997) suggested that the preference of investors over a growth stock with low BE/ME than a value stock with high BE/ME would cause the so-called value effect to be present. Daniel and Titman (1997) tested the Fama and French model on NYSE, AMEX, and NASDAQ and opposed the three-factor model as they found that the size and value premium did not affect the average returns.

In addition, there have been further arguments concerning Fama and French's findings as some researchers believed that the effects of size and value risk premia were mainly caused by the data snooping (Black, 1993; MacKinlay, 1995). Black (1993) and Mackinlay (1995) claimed that Fama and French's findings were sample specific and that the presence of the effects were mainly due to the focus on searching for the effects in a particular sample. As such, they believed that the same findings could not be found if the research was conducted with different sets of samples.

Another disagreement was raised by Kothari *et al.* (1995) in their research paper. They provided arguments that the results obtained from Fama and French (1996) were merely due to survivor bias. They claimed that the use of data from COMPUSTAT caused the researchers to only include the distressed firms that survive as COMPUSTAT normally excludes the non-surviving distressed firms. Anchored on this, Kothari *et al.* (1995) believed that the value effect did not exist in the US stock markets when they tested the stock markets using a set of data from non-COMPUSTAT sources.

2.3 Empirical Evidence of the Fama-French Model in non-US markets

In addition to the original paper published by Fama and French, a number of studies were conducted in different countries and regions. There was a test on the multi-factor model covering stocks listed on the Italian Stock Exchange. The findings were that only the market index and interest related variables would affect the stock returns and that the size and price-to-book ratio were not strong enough to measure the stock returns; instead, the size and price-to-book were dependent on the estimated period (Aleati *et al.*, 2000).

A few papers also tested the Fama and French model in Australia (Fatt, 2004; Gaunt, 2004). The results provided a better explanation of the factor(s) in terms of the share performance. Faff (2001) examined the model on the Australian stock market by utilizing the shelf index. He found that the value premium was apparent and consistent across the portfolios. Gaunt (2004) used a limited number of listed companies causing the bias to stocks with big capitalization; Fama and French was found to be superior to CAPM in their research. Gaunt further advanced his research by using a dataset covering 98% of the companies listed on the Australian Stock Exchange spanning a period of 25 years from 1982 to 2006 (Brailsford *et al.*, 2012). As the previous Australian-based studies faced the data constraint problem (lack of data availability), the studies mainly focused on either a limited period of study or limited listed stocks in the sample. This study was the first study to align the Fama and French test with the US study to follow the method adopted by the original paper to construct size-BE/ME portfolios (Brailsford *et al.*, 2012). The findings indicated that no conclusive evidence was found for size premium in their studies but value premium was indeed present consistently and significantly.

In Western Asia, Doganay (2006) investigated the Fama and French three-factor model on the Istanbul Stock Exchange. The research analyzed the stock data from July 1995 to June 2005, and found that market risk, size risk, and value were effective factors that accounted for the variations in excess portfolio returns. Similar results were also found by Al-Mwalla and Karasneh (2011) who tested the Amman stock market over the period June 1999 to June 2010. A comparison between the Fama and French model and CAPM was conducted, and confirmed that the three-factor model had more explanatory power than CAPM for the study period. Interestingly, an investigation on the Fama and French model was conducted in Pakistan using the data of stocks from the financial industry listed on the Karachi Stock Exchange. The results impressively showed the validity of the Fama and French three-factor model across 20 banks over a period of five years starting at the beginning of 2006 to the end of 2010. Another closer view of the testing of the Fama and French three-factor asset pricing model in another emerging country, India, provided the investors with empirical confirmation that the Fama and French model was supported with numerous unanswered questions to be studied in the future (Connor and Sehgal, 2001). This was supported by another research that covered 79 stocks listed on the BSE-100 stock market index in India.

In the Malaysian context, Drew and Veeraraghavan proved the existence of size effects attributed to market equity (ME) and value premium represented by the Book to Market Equity ratio (BE/ME) in their work published in 2002. The sets of market price data used in their research were from December 1992 to 1999, representing only 7 years of market information, as compared to the research of Fama and French with sets of data from US exchanges for 27 years (1962-1989). As such, in view of the above, this research tested the anomalies in the Bursa Stock Exchange using more recent 10-year data. The size and value anomalies, if present, means that investors who are able to identify this information would be able to take advantage to gain abnormal return as the stock return cannot fully be described by the CAPM. Their 2003 research work further confirmed the ability of the Fama and French three-factor model to explain portfolio returns by expanding the tests in other Asian countries, such as Hong Kong, Malaysia, Korea, and the Philippines (Drew and Veeraraghavan, 2003).

Another Malaysian study on the Fama and French model was done on a series of stocks listed on Bursa Main Market for a period of 48 months starting from 2006 to 2009 (Monfared and Wasiuzzaman, 2012). This research covered a sample size of 325 listed companies from the manufacturing industry. The results evidenced a tremendous improvement in the R-squared of the regression when two additional risk factors were added into the CAPM model. This paper, however, only documented the consistent value effect on the Malaysian stock exchange as a mixed result was found for size effect and the results did not provide strong evidence to support the presence of size effect in the Malaysian context. It is believed that size effect may not be apparent during the period of 40 months. A longer study period is proposed for the coming studies.

Meanwhile, a separate Malaysian paper specifically studied the size effect for a particular industry, i.e. real estate (Ali, 2006). The researcher randomly picked 30 real estate shares from Bursa Malaysia and ran a test over these 30 shares from 1992 to 2003. The research statistically pointed out that the shares with big capitalization generated higher returns, which was contradictory to the finding of Fama and French (1992, 1993). This needs to be verified as the size effect may be industry specific, as suggested by the findings of Ali (2006).

Abdul Rahim (2007) used CAPM and the Fama and French model to test the seasonality effect across 220 to 500 stocks on Bursa for a period of 21 years from January 1985 to December 2005. The results showed that the Fama and French model had an improved R-squared after adding the two risk premia into the CAPM model. However, this might not be conclusive as the magnitude of the intercept may deviate the results.

On the other hand, Lai and Lau (2010) tested the CAPM model, Fama and French model, and also the Carhart four-factor model (added Momentum effect) across 311 mutual funds instead of the stock market for a period of 15 years from January 1990 to December 2005. The research found the Fama and French model to be better than the single factor CAPM. However, the Carhart model was the best among the three as it had one more risk component added, which was the momentum represented by the past one-year performance.

It is understood that the Fama and French model is a better model, which includes two new factors– Size and Value risk premia – but the results are found to be controversial. Based on the previous literature, this research set its own parameters to investigate the Fama and French framework in the Malaysian setting. The data and proxies for the variables used in this research are decided and discussed in detail in the next sections based on the literature review.

3. Data and Methodology

As of 31 December 2015, the total number of companies listed on the Main Market of Bursa Malaysia was 812. The population of the listed stocks in this study is supposed to be those companies, previously or currently listed on the Bursa Malaysia Stock Exchange (“Bursa”). The working list is based on 812 listed companies; however, 3 suspended stocks due to the issuance of PN14 and PN17 were removed from the list thereby reducing the working list to 809.

Subsequently, the list was mapped against the Bursa sector classification obtained from *malaysiastock.biz* then another 33 finance stocks were removed as it is believed that the finance stocks will not provide the same meaning as the other non-financial stocks in this study. The exclusion is in line with the study carried out by Fama and French who reported in their original paper in 1992, that they believe that financial companies tend to be highly leveraged, which will likely indicate financial distress if the financial leverage is interpreted in the same way as that of non-financial companies.

A total of 500 listed companies across various industries that were present during the study period of 10.5 years from July 2005 to December 2015 were included in this study. As this research covers the study on size and value effects on the average returns of the Malaysian stock market as a whole, the firm specific risk premium is minimized by way of portfolio construction to reduce or eliminate the impact of unsystematic risk or firm specific risk caused by a single stock (Fama and French, 1993). Portfolios were constructed based on the size represented by the Market Equity (ME) and value represented by the Book-to-Market Equity (BE/ME) ratio (Fama and French, 1992, 1993, 1996).

From the modeling perspective, Model 1 below shows that the capital asset pricing model (CAPM) proposed by Sharpe (1964) and Lintner (1965) is used to predict the stock return without taking into consideration any anomalies. The Jensen's alpha represented by α_i will represent the arbitrage opportunities, if any;

Model 1: CAPM

$$PORT_i = \alpha_i + \beta_1 [R_{m,i} - R_{f,i}] + \varepsilon_i \quad (1)$$

Where $PORT_i$ is defined by Portfolio constructed $R_{p,i} - R_{f,i}$, α_i is constant, and $\beta_1 [R_{m,i} - R_{f,i}]$ is the coefficient of the market risk premium.

In Model 2, according to Fama and French's three-factor pricing model, there are three independent variables to be tested against a single dependent variable, i.e., portfolio risk premium (*PORT)*. The three independent variables are size risk premium (*SMB*), value risk premium (*HML*), and market risk premium (RISPRE). Multiple regression was used to regress the following equation.

Model 2: FF Model

$$PORT_i = \alpha_0 + \beta_1 RISKPRE_i + \beta_2 SMB_i + \beta_3 HML_i + \varepsilon_i \quad (2)$$

Where;

$R_{p,i}$	Average monthly rate of portfolio return
$R_{f,i}$	Monthly risk-free rate of return
$R_{m,i}$	Average monthly rate of market portfolio return
$PORT_i$	Average monthly constructed portfolio risk premium ($R_{p,i} - R_{f,i}$)
$RISKPRE_i$	Average monthly market risk premium ($R_{m,i} - R_{f,i}$)
SMB_i	Average excess value of the monthly excess return on a portfolio of small stocks over the monthly excess return on a portfolio of big stocks
HML_i	Average excess value of the monthly returns on a portfolio of high book-to-market (BE/ME) stocks over the monthly returns on a portfolio of low book-to-market (BE/ME) stocks

Data analyses were first conducted based on the full period of 126 months. Subsequently, the 126-monthly data were then broken into two (2) sub-periods: (i) between July 2005 and December 2010, and (ii) between January 2011 and December 2015. The former sub-period consists of the Global Financial Crisis (GFC) period while the latter consists of the period with less external market distortions. This sub-period study is added to find out and confirm the consistency of the presence of the size and value effect in both the sub-periods, thereby adding to the validity of the size and value effect on the Malaysian stock market. This analysis will also be able to show if there are differences in size and value effects during the period consisting of the crisis years (Global Financial Crisis in 2008 and 2009) versus a period of normal years.

3.1 Dependent Variable: Portfolio Risk Premium

A series of stock portfolios are constructed in that the portfolio formation can eliminate the risk premium arising from the firm specific risks by way of diversification, i.e., holding more than one stock (Fama and French, 1993). The stock portfolio is also formed to approximate the risk premium attributed to size and value.

This study attempts to depict the size and value anomalies by analyzing the returns of different portfolios based on the two variables or factors: *(1) SIZE measured by market equity (ME);* and (2) *VALUE* measured by book-market equity ratio (BE/ME).

Each year, the Size (ME) and Value (BE/ME) were derived for the 500 sample stocks across the study period of 126 months. Market data include month-end historical adjusted closing prices and market equity (or Market Capitalization) of the listed company for each sample stock counter as well as the interest rates of 3-month Malaysian Treasury Bills. Meanwhile accounting information includes the book value per share of each individual sample stock.

3.1.1 Portfolio Formation

Overall, the size and BE/ME sorts helped to form a total of six intersection portfolios, which consists of (1) Small and Low BE/ME stocks, (2) Small and Medium BE/ME stocks, (3) Small and High BE/ME stocks, (4) Big and Low BE/ME stocks, (5) Big and Medium BE/ME stocks, and (6) Big and High BE/ME stocks.

Following the construction of six intersection portfolios, the average returns of each portfolio were approximated based on the *value weighted* monthly returns of the stocks in each portfolio; this is in line with Fama and French (1993) and some other previous research studies (Drew and Veeraraghavan, 2002; Nartea *et al.*, 2008), as opposed to the *equally weighted* monthly returns suggested in other studies (Chan, 2012; Fama and French, 1992; Monfared and Wasiuzzaman, 2012). Similar to the valuation of the Malaysian Stock Indices like FBMKLCI30, this would best reflect the average returns of the stock portfolios in Malaysia.

3.2 Independent Variables: Market Risk Premium, SMB and HML

The average monthly returns of the six intersection portfolios constructed before were used to estimate the size premium (SMB) and value premium (HML) for each month during the study period.

3.2.1 Market Risk Premium (RISKPRE)

The proxy for the market risk premium (RISKPRE), $R_m - R_f$ used in this research is similar to the one used in Fama and French (1993, 1996). The value weighted monthly returns of the sample stocks were used to represent the overall market returns. This paper adopts the proxy that is similar to the original paper instead of using the historical indices of FTSE Bursa Malaysia, such as the KLCI and EMAS Index (Abdul-Rahim, 2007; Abdul-Rahim and Mohd Nor, 2006) to approximate the rate of market returns.

The monthly market risk premiums ($R_m - R_f$) throughout the study periods were then calculated by subtracting the monthly risk-free rate, R_f from the estimated monthly market rate of returns. The $R_m - R_f$ of each month were prepared as one of the independent variables for the regression of the Fama and French model.

3.2.2 Small-Minus-Big (SMB)

The average returns of big and small stocks regardless of the B/M were observed to see if firms of different size generated different excess returns. This process is to ensure that the size premium is not affected by the value premium. It is known that small firms have higher risk (if not only liquidity risk) than bigger firms. The excess returns attributed to the risk were calculated to mimic the size premium (SMB), by subtracting the average returns of the three small portfolios (SL/SM/SH) minus the average returns of the three big portfolios (BL/BM/BH). SMB is another factor that predicts the variation of portfolio returns. The excess returns are represented by SMB based on the formula below:

$$SMB = \frac{(SL + SM + SH)}{3} + \frac{(BL + BM + BH)}{3} \quad (3)$$

3.2.3 High-Minus-Low (HML)

The six portfolios were also used to estimate the HML elements in the multifactor asset pricing models. The excess returns of all six portfolios will be observed based on the level of BE/ME ratio regardless of the size of the portfolios to ensure the risk premium attributed to the BE/ME ratio is independent from the size premium. As discussed previously, a higher value stock tends to be exposed to higher distress risk than a lower value stock, thus the higher value stock would generate higher returns to compensate the additional risk exposure. In this case, the simple average of the monthly returns of two high BE/ME portfolios (SH & BH) and two low BE/ME portfolios (SL & BL) were calculated, respectively, and the differences between the average returns of High and Low BE/ME portfolios are used to mimic the monthly risk premium attributed to the value (distress), HML. The formula used to determine HML is shown below:

$$HML = \frac{(SH + BH)}{2} + \frac{(SL + BL)}{2} \quad (4)$$

4. Data Analysis and Discussion

4.1 Descriptive Statistics

Table 4.1 below provides the descriptive statistics report on the excess returns of the six portfolios and the independent variables. Following the concept of the size and value premium, the portfolio with small and high BE/ME stocks, i.e., SH, should be expected to have the highest excess returns among others. However, the results show that portfolio BM generated higher mean monthly returns of 0.520% followed by portfolio BH (Mean = 0.306%), SH (Mean = 0.290%), BL (Mean = 0.085), SM (Mean = 0,083), and SL (Mean = -0.764).

Table 4.1 Descriptive Statistics

Portfolio	Mean	SD	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SL	-0.764	5.421	-0.211	0.216	1.093	0.428
SM	0.083	4.299	-0.596	0.216	1.884	0.428
SH	0.290	5.560	-0.035	0.216	1.730	0.428
BL	0.085	3.629	-0.838	0.216	3.232	0.428
BM	0.520	4.774	-0.168	0.216	1.504	0.428
BH	0.306	6.735	-0.286	0.216	3.599	0.428
SML	-0.434	2.761	0.072	0.216	.241	0.428
HML	0.665	2.710	0.407	0.216	0.876	0.428
RISKPRE	0.187	4.138	-0.714	0.216	3.404	0.428

On average, big portfolios have higher mean excess returns relative to the small portfolios. This does not seem to support the findings of Fama and French (1992, 1993, 1996). In terms of the BE/ME value, the statistical evidence is the presence of the value effect among small portfolios only. As observed from Table 4.1, portfolio SH has the highest mean excess returns, followed by SM, and then SL. The value effect is not apparent in the big portfolios. The portfolio BM, however, has the highest excess returns, followed by BH and SH.

Overall, the big portfolios seem to generate higher excess returns and the findings contradict the results in Fama and French (1992, 1993, 1996). This is merely a high-level checking on the mean of the portfolio excess returns and would not provide a conclusion to the research findings.

4.2 Correlation Analysis

Correlation tests using Pearson's R^2 were carried out to find out the relationship among the independent variables and between the independent variable and the dependent variable. Table 4.2 presents the correlation coefficients between the variables, but it does not show a causal relationship between the variables.

Table 4.2 Correlation Test

Pearson's R Correlations	SML	HML	RISKPRE
SL	0.372**	0.417**	0.740**
SM	0.233**	0.637**	0.834**
SH	0.284**	0.746**	0.794**
BL	-0.337**	0.417**	0.968**
BM	-0.274**	0.663**	0.930**
BH	-0.171	0.752**	0.934**
SML	1		
HML	-0.072	1	
RISKPRE	-0.269**	0.587**	1

Notes: **. Correlation is significant at the 0.01 level (2-tailed).

When looking at the correlations between the independent variables, it is found that the relationship between size risk premium represented by SMB and value risk premium represented by HML is undifferentiated from zero at a Pearson R^2 value of – 0.072 with a significance level of below 1%. The zero correlation between SMB and HML indicates that the two independent variables are good measure of its own as they are free of each other (Fama and French, 1993). However, there are negative correlations between the SML and market risk premium (RISKPRE) at a coefficient of -0.269 with a significance value of below 1%. In contrast, significant and positive correlations between the HML and market risk premium are reported at a high coefficient of 0.587; the correlations may be somewhat high to indicate that the value effect is not a free measure of the market factor.

Overall, the results seem to support the findings of Fama and French (1992, 1993) as the smaller portfolios with higher size risk premium generate higher excess returns and portfolios with high BE/ME tend to have a higher value risk premium and generate higher excess returns. There is also no indication of a multicollinearity problem in this study.

4.3 Robustness Checks of the Regression

The presence of multicollinearity and heteroskedasticity in the multiple regression was also checked. The VIF and Tolerance values are commonly used to check the multicollinearity issue between the independent variables. Referring to Table 4.3, the tolerance values are recorded at 0.603, 0.916, and 0.647 for each variable, RISKPRE, SML and HML, respectively, whereas the VIF values are recorded at 1.658, 1.091, and 1.546, respectively. Statistically, a score of below 10 VIF and above 0.1 tolerance indicates no multicollinearity issue arising between the independent variables (Pallant, 2012).

Table 4.3 Tolerance and VIF

	RISKPRE	SML	HML
Tolerance	0.603	0.916	0.647
VIF	1.658	1.091	1.546

The Breusch-Pagan Test and Koenker Test were carried out to check if heteroskedasticity arises in the Fama and French regression, as shown in Table 4.4. A significant Breusch-Pagan Test and Koenker Test would indicate the rejection of homoskedasticity and assume heteroskedasticity. In this case, it is found that the assumption of homoskedasticity holds through all regressions except for portfolio SL (Breusch-Pagan, LM: 8.159, Sig: 0.043; Koenker, LM: 9.581, Sig: 0.022) and BL (Breusch-Pagan, LM: 9.983, Sig: 0.019; Koenker, LM: 8.135, Sig: 0.043). When the scatter plots (not reported here) for portfolio SL and BL were checked, the observation of the plots does not suggest serious heteroskedasticity.

Table 4.4 Breusch-Pagan and Koenker Tests

Portfolio	Breusch-Pagan		Koenker	
	LM	Sig	LM	Sig
SL	8.159	0.043	9.581	0.022
SM	3.792	0.285	3.845	0.279
SH	0.244	0.97	0.216	0.975
BL	9.983	0.019	8.135	0.043
BM	12.655	0.005	5.993	0.112
BH	5.489	0.139	5.387	0.146

4.4 Analysis on the full period

This section covers the time series regressions using a single CAPM factor and FF three-factor models against the data for the full study period of 126 months (July 2005 – December 2015).

4.4.1 Single Factor Model – CAPM

A simple linear regression using CAPM was first conducted to find out the explanatory power of market risk premium (RISKPRE) as the only factor that affects the variation of portfolio risky returns on the PORT dependent variable. Six separate regressions were run to cover all the six size-value intersection portfolios. The results from the CAPM regressions are reported and presented in Table 4.5 column 1 below.

From the results, CAPM seems to be a better model in explaining the variation of the returns for Big portfolios relative to Small portfolios as evidenced by the higher coefficients of determination, R^2. It is believed that this is attributed to the use of total weighted value stock returns as the proxy for market returns. The returns of Big portfolios tend to be accounted more in the value weighted market returns and thus it would be seen that the single factor CAPM coefficients are more provable. Comparably, the coefficient of determination (R^2) for the three Big portfolios are more than 80% indicating that the data collected for this research fit well into the model with more than 80% of the data being explained by the CAPM model. The Small portfolios, however, have less than 70% data fitness. The F-test for all portfolios shows that the single factor model is statistically significant at a significant value of less than 1% to show that single factor model provides better model fitness compared to the intercept-only model.

The results provide evidence that the single market factor, RISKPRE, plays an important role in explaining the variation of portfolio excess returns, i.e., (R_p-R_f) at p value less than 1%. However, the explanatory power of RISKPRE is not consistent throughout the six intersection portfolios with coefficients; the β_1 coefficient ranges from 0.849 to 1.52. The previous studies suggested that this observation is simply due to the use of value weighted market returns in which Big portfolios are more sensitive relative to Small portfolios.

4.4.2 Three-factor Model – FF Model

Here, a simple linear regression using the three-factor model suggested by Fama and French was conducted to find out the explanatory power of the market risk premium (RISKPRE), size risk premium (SMB), and value risk premium (HML) on the variation of portfolio risky returns (R_p-R_f). Six separate regressions were run to cover all the six size-value intersection portfolios; as shown in Table 4.5 column 2.

Overall, the Fama and French three-factor model seems to be a better model in explaining the variation of the returns for all portfolios compared to the single factor CAPM, as attributed by the higher coefficients of determination, R^2. The R^2 values were also found to be consistent among all portfolios ranging from 87.7% to 98.2%. The improved R-squared values in the Fama and French three-factor model tend to support the underlying objective of this study, which supports the idea that the FF Model is more applicable in explaining the variation in returns on the Malaysian stock market compared to the CAPM.

From the results, the market risk premium (RISKPRE), i.e., R_m- R_f, tends to remain as the most important and strongest factor that affects the portfolio returns in all six portfolios. The β-coefficient values for all portfolios are all significantly above 0.9, ranging from 0.902 to 1.274. The β-coefficient values are consistent among all portfolios (around the market Beta of 1) except for the two extreme ones, which are portfolio SL (β_1 = 1.274) and BH (β_1 = 1.256). These two extreme portfolios consist of the lowest number of stocks (SL: 34 stocks, BH: 39 stocks) compared to the rest of the four portfolios, which may suggest that the two portfolios were not effectively diversified. It is believed that the less diversified portfolios may not fully eliminate the firm specific risks and cause the β_1-coefficient (Beta) to be above the market Beta of 1. Certainly, the results show that market risk has always been the most prominent factor that accounts for the variation in portfolio returns when firm specific risks are effectively diversified by holding a stock portfolio with different classes of stocks (Markowitz, 1952).

On the other hand, size risk premium is only apparent in the three small portfolios, SL, SM, and SH. This finding provides insights into our second objective that provides inference that firms with smaller market equity (ME) will generate higher stock return than the larger firms in Malaysia. In contrast, firms with larger market equity (ME), as represented by the three big portfolios, BL, BM, and BH, tend to generate lower stock returns, which is attributed to the lower size premium. This statement can be proven by the empirical results where big portfolios, BL, BM, and BH, have either low or negative or insignificant β_2-coefficients. For instance, portfolio BL has a low negative B_2-coefficient value, portfolio BM has an insignificant β_2-coefficient, and portfolio BH has a weak β_2-coefficient at 0.144.

The presence of the third factor of the Fama and French three-factor model, value risk premium, is also evident, as shown by the study results in Table 4.5. The value risk premium represented by the β_3-coefficient has been inconsistent among the six intersection portfolios. Negative β_3-coefficients can be observed from the low BE/ME portfolios like portfolio SL and BL (β_2 = -0.217 and -0.299, respectively). Moderately low β_3-coefficients are present in portfolios with a medium BE/ME value, which are SM and BM. Portfolio SM has a β_3-coefficient of 0.256 whereas portfolio BM has a β_3-coefficient of 0.324. Evidently, portfolios with a high BE/ME value, such as SH and BH, are seen to have a very high value risk premium – portfolio SH and BH, respectively, achieved a high and significant β_3-coefficient of 0.739 and 0.753. This study's results provide strong evidence that high value stocks tend to generate higher returns, which is attributed to the higher value risk premium and supports the third objective of this study.

However, it is unknown whether the results presented above would remain unaffected during the crisis period. Hence, to ensure the consistency and reliability of the present findings across different time ranges, i.e., crisis effect, more robust analyses were added into the empirical tests by separating the study periods into two periods. The study results for the sub-periods are reported in the next section.

Table 4.5 CAPM and FF Model Full Period Analysis

	CAPM	FF-MODEL		
	β_1	β_1	β_2	β_3
Portfolio 1: SL	0.969	1.274	1.229	-0.217
	(12.246)***	(27.359)***	(21.721)***	(-3.156)***
Portfolio 2: SM	0.866	0.902	0.745	0.256
	(16.820)***	(27.359)***	(20.351)***	(5.771)***
Portfolio 3: SH	1.067	0.965	1.014	0.739
	(14.557)***	(46.314)***	(40.028)***	(24.041)***
Portfolio 4: BL	0.849	0.95	-0.081	-0.299
	(43.283)***	(60.749)***	(-4.274)***	(-12.990)***
Portfolio 5: BM	1.073	0.935	-0.073	0.324
	(28.126)***	(20.678)***	(-1.331)***	(4.867)***
Portfolio 6: BH	1.52	1.256	0.144	0.753
	(29.030)***	(26.624)***	(2.505)***	(10.837)***

Notes: * Significant at the 0.1 level. ** Significant at the 0.05 level. ***. Significant at the 0.01 level.

4.5 Sub-period Examination

As the present study periods are segregated into two study periods, this section provides the examination results of both the CAPM and the three-factor regressions, i.e., for sub-period 1 (from July 2005 to December 2009) and sub-period 2 (from January 2010 to December 2015), respectively.

4.5.1 Sub-Period 1 (July 2005 – Dec 2009: 54 months)

This sub-section covers the time series regressions using single factor and three-factor models against the data for sub-period 1 covering July 2005 to December 2009, as per Table 4.6.

In sum, it is clear that in the CAPM model, the market factor remains a significant variable that affects the portfolio returns throughout all six intersection portfolios. Portfolio BH has an extremely high market effect with a β_1-coefficient value of 1.536, whereas portfolio SM is least affected by the market risk factor, with a β_1-coefficient of 0.799.

On the other hand, multiple linear regression using the Fama and French three-factor model found that the market risk premium (RISKPRE) is the main factor that affects the variation of portfolio risky returns (R_p-R_f) by adding other potential stock market anomalies, i.e., size (SMB) and value (HML) risk premia. The results from the Fama and French regressions are reported and presented in Table 4.6 below. To better embrace the results, this research compares the findings from the Fama and French model against those of the CAPM.

In terms of size premium, it is only found statistically significant in the small portfolios, SL, SM, and SH, which is supportive of the results provided by the full period examination. As for the big portfolios, BL, BM, and BH, the results either show low or insignificant size effect in these portfolios, which, in turn, provides evidence that stocks with market capitalization yield better returns as smaller firms are normally riskier (risk and returns trade-off). The results for the sub-period 1 examination confirm the presence of the size effect and support that stocks with smaller market equity (ME) will generate higher stock returns than the larger firms in Malaysia.

The third factor of the Fama and French three-factor model, value risk premium, is also found present; as reported by the study results in Table 4.6. The β_3-coefficient is also inconsistent among the six intersection portfolios. Negative β_3-coefficients are evident from the low BE/ME portfolios like portfolio SL and BL (β_2 = -0.23 and -0.292, respectively). Portfolios with a medium level of BE/ME value have moderately low β_3-coefficients. It can be seen that portfolio SM has a factor loading (β_3-coefficient) for HML of 0.242 whereas portfolio BM has a loading of 0.29. For the portfolios with high BE/ME value, the factor loadings tend to be high, for instance, portfolio SH recorded a high loading of 0.747 while BH has a loading of 0.751. The results show that high value stocks tend to generate higher returns, which is attributed to the higher value risk premium.

This section provides fairly consistent and similar results to those tested using the full period data. Sub-period 1 covers the crisis period between the year 2008 and 2009 and the findings clearly reveal that there the size and value effects are present even during the crisis period. The results were re-checked by adding one more period specific test using the data for sub-period 2 from January 2010 to December 2015.

Table 4.6: CAPM and FF Model Sub-Period 1 Analysis

	CAPM	FF-MODEL		
	β_1	β_1	β_2	β_3
Portfolio 1: SL	0.874	1.299	1.199	-0.23
	(8.944)***	(19.692)***	(13.242)***	(-2.394)***
Portfolio 2: SM	0.799	0.961	0.86	0.242
	(10.618)***	(21.241)***	(13.848)***	(3.682)***
Portfolio 3: SH	0.9	0.905	0.929	0.747
	(9.427)***	(29.882)***	(22.341)***	(16.944)***
Portfolio 4: BL	0.863	0.942	-0.08	-0.292
	(32.579)***	(44.957)***	(-2.771)***	(-9.573)***
Portfolio 5: BM	1.036	0.893	-0.131	0.299
	(18.381)***	(11.926)***	(-1.278)***	(2.751)***
Portfolio 6: BH	1.536	1.33	0.2	0.751
	(20.311)***	(18.540)***	(2.028)***	(7.203)***

Notes: * Significant at the 0.1 level. ** Significant at the 0.05 level. ***. Significant at the 0.01 level.

4.5.2 Sub-Period 2 (Jan 2010 – Dec 2015: 72 months)

This section covers the time series regressions using single factor and three-factor models against the data for sub-period 2 between the years from January 2010 to December 2015; as per Table 4.7.

The Fama and French three-factor model, with regards to sub-period 2, was again applied to confirm the explanatory power of market risk premium (RISKPRE), Size premium (SMB) and Value premium (HML) as the main factors concerning the variation of portfolio risky returns (R_p-R_f). The results from the Fama and French regressions were collated and are reported in Table 4.7 below. The comparison between the findings from the Fama and French model against those of the CAPM were also done to provide a better understanding of the interaction of the two stock anomalies and the market risky returns.

In addition, the regression results of the FF model provide solid evidence that small portfolios would generate better returns due to the higher inherent risks of the stocks with small market capitalization. This again suggests that firms with smaller market equity (ME) will generate higher stock return than the larger firms in Malaysia. The β_2-coefficient (factor loading for size risk premium, SMB) is high for all three small portfolios (SL = 1.325, SM = 0.663, and SH = 1.042), and almost zero or insignificant for all three big portfolios (BL = -0.097 at p = 0.000; BM = -0.059 at p = 0.357, and BH = 0.186 at p = 0.012). This examination clearly illustrates and explains the impact of size on the variation of portfolio returns.

When examining the third factor of Fama and French model, the factor loadings for value risk premium (HML), represented by β_3-coefficients, were assessed and compared between the six intersection portfolios. High factor loadings for HML are found in the high value portfolios like SH and BH with significant β_3-coefficients of 0.746 and 0.748, respectively. Subsequently, the medium level of factor loadings for HML are present in the medium value portfolios, such as portfolios SM and BH with significant β_3-coefficients of 0.254 and 0.366, respectively, while the small portfolios, SL and BL, have either a negative or insignificant factor loading for HML. Portfolio SL has a β_3-coefficient of -0.196 at an insignificant level of p value more than 5% and portfolio BL has a statistically significant negative β_3-coefficient of -0.31. The results tend to provide evidence that high value stocks, despite their size, would generate higher returns compared to the low value stocks; thus, supporting the presence of the value effect.

Table 4.7 CAPM And FF Model Sub-Period 2 Analysis

	CAPM	FF-MODEL		
	β_1	β_1	β_2	β_3
Portfolio 1: SL	1.167	1.199	1.325	-0.196
	(8.761)***	(15.860)***	(16.755)***	(-1.889)*
Portfolio 2: SM	1.006	0.863	0.663	0.254
	(14.098)***	(19.449)***	(14.279)***	(4.170)***
Portfolio 3: SH	1.407	1.028	1.042	0.746
	(12.778)***	(34.871)***	(33.804)***	(18.430)***
Portfolio 4: BL	0.824	0.106	-0.097	-0.31
	(26.341)***	(35.604)***	(3.398)***	(-8.313)***
Portfolio 5: BM	1.146	0.984	-0.059	0.366
	(21.308)***	(16.122)***	(-0.928)***	(4.363)***
Portfolio 6: BH	1.482	1.138	0.186	0.748
	(19.440)***	(16.482)***	(2.572)***	(7.893)***

Notes: * Significant at the 0.1 level. ** Significant at the 0.05 level. ***. Significant at the 0.01 level.

5. Conclusion

Overall, this research has highlighted, firstly, that the Fama and French three-factor model is applicable in the Malaysian context. The Beta of the six portfolios makes more sense in the Fama and French model compared to the CAPM. The results also suggest that the CAPM does not seem to provide reliable asset pricing modeling for small portfolios as the coefficients of determination for the small portfolios are not sufficiently high compared to the bigger portfolios. The same findings were observed in previous studies done in the US context (Amanda and Husodo, 2014; Connor and Sehgal, 2001; Davis, Fama and French, 2000; Fama and French, 1993, 1996; Nartea *et al.*, 2008) as well as in the Malaysia context (Abdul-Rahim, 2007; Drew and Veeraraghavan, 2002; Drew and Veeraraghavan, 2003; Monfared and Wasiuzzaman, 2012). Secondly, firms with smaller size will generate higher stock returns than the larger firms in Malaysia, and, finally, firms with higher value will generate higher stock returns than the lower value firms in Malaysia. These findings also remain consistent in the crisis period. In addition, the strong and consistent Beta coefficients in sub-period analysis further support the position of the Fama and French model validity and applicability across the crisis and non-crisis period.

The findings of the present study would enable investor's, especially institutional investors, to understand the factors affecting the returns of stock listed on Bursa Malaysia. It is believed that with the identification of the anomalies and their effects on the stock returns, investors could possibly take advantage of arbitrage opportunities even in a free and efficient market environment. As for future research, the findings indicate that the Fama and French model is more explanatory relative to the CAPM in respect of the Malaysian stock market.

In continuing the effort to test the applicability and validity of the Fama and French model, more out-of-sample checks need to be carried out to validate the robustness of the model. Similar tests could be extended to other ASEAN countries like Singapore, Thailand, Indonesia, Vietnam, and the Philippines to provide a more conclusive idea of the size and value anomalies in the ASEAN emerging stock markets.

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