

# REVISITING THE FAMA AND FRENCH THREE-FACTOR MODEL FOR THE CASE OF VIETNAM

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*This paper is to investigate the fitness of the Fama and French three-factor model in the HCMC Stock Exchange (HOSE) over the period 2007-2009. The results have proven that this model is more superior to the capital asset pricing model (CAPM) when explaining changes in the total risk premium or the return on equity in HOSE; yet it is not to veto that CAPM is not an effective tool to analyze the total risk premium or the return on equity, which is not only affected objectively by the market forces but also subjectively by features of listed companies such as their size and value (the book-to-market ratio [BE/ME]). The results also figure out that the market factor out of three factors produces the biggest effect on the total risk premium of a stock. In other words, although investors in HOSE have attended to features of listed companies, it is kind of humble. Their investing decisions are mainly based on ups and downs of the market.*

*Keywords: Fama and French three-factor model, Vietnam*

## 1. Literature review

Theories on capital market have facilitated the development of the portfolio theory introduced by Harry Markovitz in 1952, and risk-weighted asset pricing models. In the early time, William Sharpe did propose his Capital Asset Pricing Model (CAPM) which was first published on the Journal of Finance in 1964. CAPM allows us to define the essential return on a risk-weighted asset by adding the market risk premium of such the asset to the risk-free interest rate of treasury bills. However, CAPM, when tested in different markets at different periods, did not always produce expected results. Thus, numerous studies have been conducted then and many observed variables have been added to the pricing model. We can ex-

emplify the study of Eugene F. Fama and Kenneth R. French in 1992.

Fama and French have tried to evaluate the role of market's beta, size, P/E ratio, financial leverage, and BE/ME within the average return of different sectors on stocks of NYSE, AMEX and NASDAQ. Previous studies did find out the positive relationship between return and beta. The study by Fama and French has pointed out the relationship between beta and the average return which did vanish during the period 1963 – 1990 even in times when only beta is employed to explain the average return. Vice versa, sole tests have found that the average return has significant rapports with firm size, financial leverage, P/E ratio and BE/ME. This study is to investigate the

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Fama and French three-factor model in HOSE.

## 2. Fama and French three-factor model

Fama and French recognize that the beta factor of CAPM developed by William Sharpe could not explain changes in the average return on securities in the US market during the period 1963 – 1990. Thus, they started to observe the average return on stocks listed in NYSE, AMEX and NASDAQ; and realized two classes of stock whose average return tended to be better than that of the whole market, including small caps and high book-to-market ratio. Accordingly, they developed the model of three factors, viz. market's risk premium, book equity, and company size. Of them, the book-to-market ratio represents the company's value; and the market capitalization stands for the company's size. In other words, small caps will have small size; big caps have big size; stocks with high book-to-market ratio are called value stocks; stocks with low book-to market ratio are called growth stocks. In this model, small-cap stocks own an expected risk premium higher than that of big caps; and value stocks have an expected risk premium higher than that of growth stocks. The Fama-French model can explain over 90% ( $R^2 \geq 0.9$ ) of the diversified portfolios returns in the US market (NYSE, AMEX and NASDAQ) compared to the 70% ( $R^2 = 0.7$ ) produced by CAPM.

The value premium represents the difference between the average portfolio return on value stocks and that on growth stocks. Similarly, the size premium represents the difference between the average portfolio return on small-cap stocks and that on big-cap stocks. Factors developed within the Fama-French model can be explained as follows:

- Market premium is the premium for investor-burdened risks related to market factors.
- Size premium is the premium for impacts of company size
- Value premium is the premium for impacts of company's value

The formula of the Fama-French model can be written as follows:

$$\bar{R}_{it} - R_{ft} = \alpha + \beta[R_{mt} - R_{ft}] + sSMB_t + hHML_t + \varepsilon_t$$

Where,

$\bar{R}_{it} - R_{ft}$  : Total risk premium at the time t

$\alpha$  : Ordinate origin of the regression equation

$\beta(R_{mt} - R_{ft})$  : Market premium at the time t

$sSMB_t$  : Size premium at the time t

$hHML_t$  : Value premium at the time t

$\varepsilon_t$  : Random error at the time t

$\bar{R}_{it}$  : Expected average return on stocks at the time t

$R_{mt}$  : Market return at the time t

$R_{ft}$  : Risk-free interest rate (treasury bill rate) at the time t

$\beta, s, h$ : Partial regression coefficients

$SMB_t$  (small minus big): the difference between the average return of small-cap stocks and that of big-cap stocks at the time t

$HML_t$  (high book-to-market minus low book-to-market): the difference between the average return of stocks with high book-to-market ratio (value stocks) and that of stocks with low book-to-market ratio (growth stocks) at the time t

## 3. Previous results from testing the Fama-French model

The Fama-French model has been tested in many different markets and produced the following results.

\* All regression coefficients of portfolios allocated by Bundoo to the Fama-French model have the significance of 99%. Thus, Bundoo did not run the mono-variable regression model.

Such studies conducted in the US, France, New Zealand, Australia, South Africa, India, Hong Kong, Korea, Malaysia and Philippines rendered that the average return on portfolios of small caps is higher than that of big caps; and that the relationship between the company's size and the return on equity is inverse. These studies also showed that the return on stocks with high book-to-market ratio is higher than the return on those with low book-to-market ratio; in other words, the return of growth stocks is lower than that of value stocks; and that the relationship between the return on equity and the book-to-market ratio is positive. However, the study by Bhavna Bahl (2006) for the emerging market of India produced the in-

**Table 1: Results from testing the Fama-French model and CAPM in Vietnam and other markets in the world**

Stock exchanges	Researchers and years of publication	$\bar{R}^2$ of CAPM	$\bar{R}^2$ of Fama-French model
NYSE, AMEX & NASDAQ (1963-2003)	Nima Billou (2004)	0.72	0.89
France (1976-2001)	Souad Ajili (2005)	0.714	0.905
New Zealand (1994-2002)	Nartea & Djajadikerta (2005)	0.36	0.441
Australia (1981-2005)	Michael A. O'Brien (2007)	0.439	0.73
South Africa (1998-2004)	Sunil K Bundoo (2006)	*	0.71
India (2001-2006)	Bhavna Bahl (2006)	0.76	0.87
Hong Kong (1993-1999)	Drew & Veeraraghavan (2003)	0.4	0.625
Korea (1991-1999)		0.51	0.793
Malaysia (1991-1999)		0.7	0.893
Philippines (1994-1999)		0.42	0.653
HOSE (Jan.2005-Mar.2008)	Vương Đức Hoàng Quân & Hồ Thị Huệ (2008)	0.625	0.868

verse, viz. the return would soar up when the book-to-market ratio increases from low to medium; and go down when from medium to high.

In Vietnam, the study by Vương Đức Hoàng Quân and Hồ Thị Huệ in HOSE in 2008 also figures out that the average return of small caps is higher than that of big caps; and that the relationship between the company's size and the return on equity is inverse. This study rendered that the return on stocks with low book-to-market ratio is higher than the return on those with high book-to-market ratio; in other words, the return of growth stocks is higher than that of value stocks; and that the relationship between the return on equity and the book-to-market ratio is inverse. This is to state, the research results of these two authors are contrary to findings from both developed and emerging markets.

Nonetheless, there are some points in the study by Vương Đức Hoàng Quân and Hồ Thị Huệ to be reconsidered, that is, the market value of equity are calculated by the product of the quantity of stocks issued and the market value of stocks; the risk-free interest rate employed for the study is that of the five-year government bond; and the number of samples is too humble (28 companies). The market value of equity should be calculated by the product of the quantity of outstanding ordinary stocks and the market value of stocks. The quan-

tity of stocks issued is different from the quantity of available stocks if the company buys back its outstanding stocks and keep them as reacquired stocks. The risk-free interest rate should be taken from treasury bills due to the fact that the five-year government bond may involve inflation as their potential risk. The number of samples (28 companies) is so humble that its statistical significance is rather low.

The study by Đinh Trọng Hưng in HOSE in 2008 also expresses itself some drawbacks, that is, (1) the risk-free interest rate was taken from the five-year government bond, (2) the  $R^2$  of each stock code was produced without running the regression model equation, (3) the number of samples was too modest (just 26 companies), (4) the duration of observation was too short (just 15 months as from Sept.30, 2006 to Dec.31, 2007), and (5) the study conducted in HOSE in 2008 did produce the same regression results as those of Vương Đức Hoàng Quân and Hồ Thị Huệ .

## 4. Research design

This study is to investigate the fitness of the Fama and French three-factor model in HOSE by linear regression analyses based on ordinary least squares (OLS) with the secondary database, which is mainly from financial statements and prospectuses and number of outstanding ordinary stocks retrieved from websites of HOSE

(www.vse.org.vn) and BIDV (www.bsc.com). The risk-free interest rate employed in the research is that of treasury bill retrieved from the State Bank's website (www.sbv.gov.vn). Besides, the VN-index and the closing prices of stocks from listed companies after each trading session were retrieved from www.cophieut68.vn. This study is just to investigate non-financial companies listed in HOSE before Jan.01, 2007 with database collected from 2007 through 2009.

The study tests the following hypotheses:

- H1: There is a positive relationship between the market risk (Market) and the total risk premium of stocks.
- H2: There is an inverse relationship between the company's size (Size) and the total risk premium of stocks.
- H3: There is a positive relationship between the company's value (Value) and the total risk premium of stocks.

The variables of the study have been explained in the Table 2 below.

**Table 2: Research variables**

Variable	Symbol	Explanation
Total risk premium	$RP_i$	$\bar{R}_i - R_f$ : The difference between the expected average return on equity and the treasury bill interest rate
Market premium	$RP_m$	$R_m - R_f$ : The difference between the market return and the treasury bill interest rate
Size premium	SMB	The difference between average return on small-cap stocks and that on big-cap stocks
Value premium	HML	The difference between the average return on stocks with high book-to-market ratio (value stocks) and that on stocks with low book-to-market ratio (growth stocks)

The book equity is the equity value of a company as shown in its financial statement. The market equity is the product of the market value of a share and the quantity of outstanding stocks. The risk-free interest rate is the daily interest rate of treasury bill. After calculating the market

equity of each companies in the study, their stocks are classified into two different groups on the basis of the median value of the market equity as follows:

- Group S (small-cap) includes stocks with the market equity smaller than the median value.
- Group B (big-cap) includes stocks with the market equity larger than, or equal to, the median value.

Identically, we calculate statistical values of the book-to-market ratio and then classify them into three groups:

- Group L (low) includes 30% of stocks with the smallest book-to-market ratio.
- Group M (medium) includes 40% of stocks with the median book-to-market ratio.
- Group H (high) includes 30% of stocks with the highest book-to-market ratio.

By combining these five groups together, we will have six types of company's size (S/L, S/M, S/H, B/L, B/M, B/H).

On Jan.01, 2007, there were 95 publicly-held companies and six securities companies in HOSE. These companies are left out this study due to the fact that some of them did not trade on the floor some times and two companies did not provide with the financial statements (the Quarter II/2009 financial statement of IFS and the Quarter IV/2009 financial statement of VIS). Therefore, there are 76 suitable companies observed in the study. Financial indicators are taken from 2007 through 2009. The securities prices have been observed in 749 trading sessions for each observed company.

The median value is calculated on the ground of market equities of 76 companies. By this median value, we classify stocks into two groups of S and B; and each group will contain 38 stocks. After having the book-to-market value, there are 23 stocks for group L, 30 ones for group M, and 23 ones for group H.

SMB explains the difference over trading sessions between the average return on small-cap stocks (S/L, S/M, S/H) and that on big-cap stocks (B/L, B/M, B/H). HML is the difference between the average return on stocks with high book-to-



market ratio (S/H, B/H) and the return on those with low book-to-market ratio (S/L, B/L).

## 5. Testing results

Collected data have been processed via three steps: statistical descriptions, correlation analyses and running regression model respectively. The stat values of research variables are rendered in

**Table 4: Regression results**

**Model summary**

Model	R	R <sup>2</sup>	R <sup>2</sup> adjusted	Estimate standard deviation
1	.951 <sup>a</sup>	0.904	0.904	0.62263

Predictors: (constant),  $RP_m$ , SMB, HML

**Linear regression results**

Model		Non-standardized coefficients		Standardized coefficient	T	Sig.	Collinear statistics	
		B	Standard deviation	Beta			Tolerance	VIF
1	(Constant)	-0.026	0.023		-1.149	0.251		
	$RP_m$	0.922	0.011	0.97	83.273	0	0.944	1.059
	SMB	0.39	0.033	0.175	11.838	0	0.589	1.697
	HML	0.119	0.029	0.059	4.097	0	0.616	1.622

Dependent variable: risk premium ( $RP_i$ )

the Table 3.

**Table 3: The statistical descriptions of variables (N=749)**

Items	Min	Max	Mean
$RP_i$	-4.72%	4.79%	-0.06%
$RP_m$	-4.72%	8.04%	-0.06%
SMB	-3.91%	3.52%	0.03%
HML	-3.99%	4.12%	0.02%

Regression results (Table 4) for testing the Fama and French three-factor model have shown that the  $R^2$  and the adjusted  $R^2$  are quite high (0.904). This is to say, the data taken from 2007 through 2009 in HOSE for testing the Fama-French model can explain 90.4% of risk premium of average returns on stocks listed in HOSE. The ANOVA table also renders the Sig value of regression equation is smaller than 0.05, proving that the statistical significance of 1% of the research model is suitable to the regression equation. Thus, the three hypotheses are acceptable and suit the empirical model:

$$\overline{R}_i - R_f = -0.026 + 0.922 \cdot (R_m - R_f) + 0.390 \cdot \text{SMB} + 0.119 \cdot \text{HML}$$

## 6. Conclusion

The Fama and French three-factor model explains changes in the total risk premium or the return on equity listed in HOSE better than CAPM; yet CAPM, with the explaining level of 80%, is still an effective tool for individual investors. The total risk premium or the return on equity listed in HOSE is affected not only by market factors but also by the size and value of listed companies. Of three factors affecting the risk premium of stocks, as shown in the research results, the market is the most significant. Factors such as size and value of listed companies explain the return on stocks at a humble level. In other words, the market's upheavals are the main factor affecting the decision of investors in the period 2007 – 2009. Taking the early year 2007 into account, when the VN-index hit the peak of 1170 points, investor did rush to acquire stocks without caring about who had offered them, which industry they belonged to, how the listed companies performed, and etc. Besides, this study also provides investors with an effective tool to foresee the return of stocks in HOSE and make the best investment■

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