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APPLICABILITY OF CAPM AND FAMA FRENCH THREE-FACTOR MODEL: A TEST FROM VIETNAM STOCK MARKET

Master's Thesis in
Accounting and Finance
Finance

VAASA 2018

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UNIVERSITY OF VAASA

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Bachelor's/Master's Programme: Finance
Year of Entering the University: 2015
Year of Completing the Thesis: 2018
Pages: 58

ABSTRACT

Capital Asset Pricing Model or CAPM being suggested and developed by Sharpe (1964), Lintner (1965) and Black (1972) is considered one of the functional contributions to Finance. This model believes that risk premium of all risky assets is a linear function of their covariance with market portfolio. The recent study of Fama and French (1996 and 2006) introduces us to the Three-factor model theory which questions the applicability of CAPM in the real market and its ability in explaining stock returns as well as value premium effects in American stock market.

This thesis is inspired by the study of Fama and French (1996 and 2006), but with another data sample from Vietnam stock market, one of the youngest stock markets in the world. Multiple regressions are used to compare the performance of CAPM and Fama French three-factor model in explaining stock returns and value premium effects in Vietnam stock market.

The findings show that Fama French three-factor model performs significantly in Vietnam stock market and is superior to CAPM in explaining both stock returns and value premium effects. In three-factor model, market risk premium factor affects the most on stock returns, followed by value factor and size factor, respectively. Besides this study also supports the applicability of CAPM in Vietnam stock market.

KEY WORDS: Applicability, CAPM, Fama French, Vietnam stock market.

1. INTRODUCTION

Vietnam Stock Market has been founded for 15 years, although it reached certain achievements, it has remained much weaknesses and risks. Nowadays, in Vietnam exists mostly private investors who have invested primarily based on stock companies' recommendations which have been evaluated by Discounted Cash Flow (DCF) or Relative Method. Nevertheless, in the current volatilized situation of the market, these methods seem to be inefficient and cannot forecast market's movements for investors to make economic decisions more flexibly.

Therefore, studying applicability of modern financial theories to stock markets nowadays is important and urgent. Moreover, there are many studies in applying financial theories into stock markets, especially empirical studies in emerging markets had significant results. Those also confirm models' correctness and practicality. Considering the need of applying financial models to predict the stock markets, I decided to study about the applicability of two famous asset pricing models – CAPM and Fama French three-factor model to forecast returns in Vietnam Stock Market.

1.1. Intended contribution

Nowadays in Vietnam, there have not been any applications of asset-pricing models yet. However, there is a significant need to apply financial models in the stock market to predict risks and returns of stocks. Two famous models, Capital Asset Pricing Model (CAPM and Fama – French three–factor model, can be a sufficient response to this command. These models were examined empirically in some countries around the world and have been applied efficiently in business. This study is based on an investor´s opinion to investigate the probability of applying two models to Vietnam Stock market. By doing this, the study can hopefully recommend another financial tool for investors to make economic decisions more flexibly and efficiently.

In this study, I would like to introduce investors a financial tool to analyze and forecastrisks and returns of stocks and portfolios. This can be useful for investors in deciding to hold what kind of stocks and portfolios. Simultaneously, this study can give us an evaluation of what factors have influenced Vietnam Stock market. With the results of this study, hopefully I can help investors to realize risks and returns, discover market trends, understand deeply the original nature of returns and the assets´ real value, and have a reliable tool to make economic decisions.

In the future, with longer period and better data stream, I suggest investigating the other factors to make the models more efficiently in Vietnam Stock market. In fact, there are four – factor or five – factor model in current financial studies around the world.

1.2. Problem statement

The tested hypothesis can be written as follow:

H_1: CAPM is significant in Vietnam Stock Market.

H_2: Fama French Three-factor model is significant in Vietnam Stock Maket.

H_3: Fama French Three-factor model is better than CAPM in explaining stock returns in Vietnam stock market.

1.3. Structure of the study

This thesis has 6 chapters. Chapter 1 describes the motivations and possible contributions to Vietnam stock market in using financial models to forecast market. Chapter 2 will summarize some famous studies about applicability of CAPM and Fama French three-factor model in both developed and developing countries. Next,

chapter 3 will introduce generally about CAPM and Fama French model. Then, Chapter 4 states factors which have influences on stock returns in Vietnam stock market. Chapter 5 will present my regression test of applicability of CAPM and Fama French model in Vietnam. Finally, Chapter 6 will conclude what this thesis finds out.

2. LITERATURE REVIEW

There are so many empirical studies on CAPM because it is the one of cornerstone theories of finance. It was investigated multiple times where it was complimented and has raised much arguments as well. Both cross-section and time-series analysis are very popular in the studies about CAPM. However, the traditional studies did not provide significant results about the validity of CAPM because of correlated residuals. The following regression equation with the means of stock excess returns and market excess returns which is suggested by Fama and MacBeth (1973) in order to overcome the independence of residuals:

$$R_i - R_f = \gamma_0 + \gamma_i \beta_i + e_i \quad (1)$$

The empirical results show that the poor quality of proxies of market portfolio can harm the performance of CAPM. (Gibbons, Ross and Shanken, 1989) Moreover, Fama and French study indicates that although the relation between stock returns and beta is almost linear, the actual line is flatter than the one being predicted by CAPM. This can be because of other factors such as size, earning to price, book to market value and debt to equity, which cannot be explained only by systematic risk factor alone. (Fama & French, 2004) Moreover, CAPM does not account for time variant factors in calculating asset risks in cross-sectional and time variant data. (Lettau & Ludvigson, 2001) Many researchers have come to extended version of this model such as the conditional CAPM to surpass the original CAPM limitations. Nonetheless, Graham and Harvey (2001) conducted a comprehensive study and found that 73.5% among 392 American CFOs using this model to measure equity price. Moreover, Brounen, Jong and Koedijk (2004) conducted a similar study with 313 European companies and found that almost 45% companies relying on CAPM.

There are quite a few of studies supporting CAPM overall, such as Black, Jensen and Scholes (1972) and Fama and MacBeth (1973). However, some biases of CAPM were found in 1980s and 1990s raising questions about this model. In a research, Basu (1977) found that high E/P stocks have future return higher than one

predicted by CAPM. Besides, Bhandari (1988) proved that leverage is positively related to expected stock returns.

Fama and French (1993) suggested a new model with 3 new additional factors in order to explain expected stock returns better. They observed that small market cap stocks and low P/B stocks will earn higher returns than over all market. Therefore, they added 2 additional factors into CAPM. Then we have a new asset pricing model called Fama French three-factor model.

Many studies have been conducted to investigate the validity of Fama French three-factor model in explaining and predicting variations of stock returns while others answer the question whether Fama French three-factor model is superior to the traditional CAPM.

Daniel and Titman (1997) used monthly data of the period from July 1963 to December 1993 for NYSE, AMEX and NASDAQ stock market. The results of Daniel and Titman study did not support Fama French three-factor model. They showed that both size and book to market equity are highly correlated to mean of stock returns. They concluded that stock characteristics not their risks explain cross-section stock returns. They also concluded that investors like growth stocks (strong company) and dislike value stocks (weak company). They also implicated that market beta factor cannot explain stock returns. Responding to Daniel and Titman study in 1997, Davis *et al.* (2000) extended the data from 1929 to 1927 and showed that study results of Daniel and Titman (1997) were not significant because they used relatively short data set and three-factor model explained premium better than characteristics explanations. They also observed that value effects are so strong in the US stock market and the relation between stock returns and book to market equity is positively significant. Faff (2001) used monthly data for 24 Australian industries over the period from 1991 to 1999. He investigated the validity of Fama French three-factor model by using Generalize Method of Moments (GMM test). He implicated that with the data set he used, GMM test strongly support for three-factor model. He also observed the negative correlation

between size and mean of portfolio returns. In other words, small industries in Australia earned a higher return than big industries. He also showed that the relation between risk premium and market return and book to market equity is significantly positive. Drew and Veeraraghavan (2003) used data from 4 Asian emerging markets Hong Kong, Korea, Malaysia and Philippines over the period from 1991 to 1999 to investigate the ability of Fama French three-factor model in explaining the variations of stock returns. They concluded that Fama French three-factor model has a superior power in explaining the average return of stock in all 4 countries. Using the daily data from Australia stock market, Faff (2004) conducted a study for Fama French three-factor model. Using the data from industrial sector, study results show that Fama French model provides a convenient assessment for risk premium. The results also show that three-factor model is still better than CAPM in explaining the excess stock return.

There are also many studies investigating the validity of asset pricing models in emerging country markets. Petkova (2006) used the daily data from July 1963 to December 2001, investigating the ability of Fama French three-factor model in capturing the investment opportunities which appear on the market. Generally, both SMB and HML provide a sufficient prediction of excess market return and the variations in this return. Both these factors are also highly correlated to these opportunities and provide a better explanation for variations of stock returns, but not for cross-section return. He concluded that International Capital Asset Pricing Model (ICAPM), suggested by Merton (1973) provides a better cross-section explanation than Fama French three-factor model in the data and time he used. Rahaman (2006) used the data from Bangladesh for the period of 1999 and 2003 and used data from non-financial companies listed on Dhaka stock market. They found that stock returns are not only determined by market beta but also other factors such as firm market capital, firm sale, book to market value. Homsud *et al.* (2009) compared between Fama French three-factor model and CAPM in Thailand stock market, using the data for 421 companies. They also found that Fama French three-factor model provides a better explanation for stock and portfolio returns than CAPM.

3. CAPM AND FAMA FRENCH THREE-FACTOR MODEL

Stock pricing plays an important role in making a fairly and smoothly running market. In fact, when stock price is evaluated accurately and announced publicly, the same investors can have the same opportunity on the stock market because they can take the same amount of information. A fair market is a market where there is fairness between investors, buyers and sellers at a reasonable price. That fairness will in turn help the market to operate well and smoothly. Therefore, studying asset pricing models, such as CAPM and Fama French Three-factor model, is worth your time.

3.2. Capital Asset Pricing Model – CAPM

3.2.1. Assumptions

Capital asset pricing model or CAPM is a model explaining the relationship between risk and expected returns. In this model, expected returns equal to the total of risk-free returns and a risk premium for the systematic risks of the stock.

CAPM was developed by three economists William Sharpe, John Linnet and Jack Treynor in 1960s and has been applied until now. Although there were many models being invented to explain the market movements, CAPM has been a theoretically simple and have a huge potential to apply. Just like the others, this model just simplifies the reality but it has still allowed us to apply usefully.

Because the capital market theory was based on the Markowitz portfolio theory, it also needs the same assumptions. Besides, there are also the following assumptions:

(1) All the investors are the efficient Markowitz investors who are expecting to hold a portfolio on efficient line. Therefore, the exact position on efficient line and the specific holding portfolio will depend on the investor's Utility function risk and

returns.

(2) Investors can lend and borrow any amount of money at free-risk rate – R_f.

(3) All investors have the same expectations, which means they have the same stock returns contribution in the future. However, this assumption can be ignored because the difference between the expectations is not big and then its influence can be small.

(4) Investors have the same investing period, such as one month, six months or a year. This model will be constructed in the assumed period and its results can be different in another period. A different investing period might ask investors to identify another risk evaluation and consistent risk-free assets.

(5) All investing assets can be divided flexibly, which means investors can buy and sell any portions of any assets or portfolios. This assumption might allow us to discuss more about combinations of invests to be a continuous curve.

(6) There are no taxes and transaction fees.

(7) There is no inflation or any changes in interest rates or inflation is reflected completely in rates.

(8) Capital markets are in balance, which means we start with all the assets which are assessed correctly with their risks.

3.2.2. CAPM and Market risk premium

The model indicates that an expected return of a stock equals to risk-free rate and a premium based on its stock's systematic risks. Unsystematic risks are not measured in this model because investors can diversify portfolios to eliminate these risks out.

In CAPM, the relationship between returns and risks is described by the following formula:

$$E(R_i) = R_f + [\, E(R_M) - R_f \,] * \beta i_M \qquad (2)$$

$E(R_i)$ is expected returns of a portfolio i.

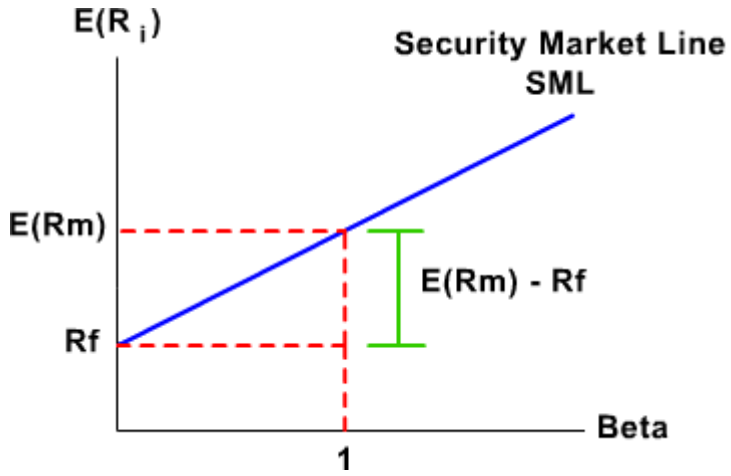
R_f is risk-free rate.

$E(R_M)$ is expected returns of market portfolio.

β_{iM} is market β of portfolio i.

Geometrically, the relationship between expected stock returns and risk indicator β is described by a line called Security Market Line (SML).

Chart 1: Relationship between stock and returns



Looking at the Figure 1, we can see at the higher β, the higher expected returns we can earn, also we must bear more risks. β = 0: expected return of stocks which have β = 0 is the risk- free rate, R_f. β = 1: expected return of stocks which have β = 1 is the market return, $E(R_M)$. The relationship between returns and β of a stock is linear

relation described by the line SML with the slope $E(R_M) – R_f$.

3.2.3. Expanding CAPM assumptions

The difference between borrowing rate and lending rate

An investor can lend an unlimited amount of money at risk-free rate, but there are people doubting about the ability of borrowing infinitely at risk-free rate because almost investors must pay a premium relating to basic interest rate when borrowing.

Investors can lend at the risk-free rate R_f and invest this money into portfolio F on the efficient line. But we cannot expand this line to the right if we are unable to borrow at risk-free rate to invest more into the risky portfolio F.

Investors can borrow at interest rate R_b, then the contact point of the line coming from efficient line occurs at the point K. This point shows us that we can lend at rate R_b and use this money to invest to portfolio K to expand Capital Market Line – CML.

CAPM with transaction fees

One basic assumption of CAPM is there is no transaction fee, so investors can buy and sell mispriced stocks until they reach points on SML.

With the existence of transaction fees, investors would not adjust these price differences because in some cases, costs of buying and selling mispriced stocks will offset potential outstanding returns.

Therefore, stocks will place very close to SML but not on that line, and SML will be a collection of stocks rather than only a single line.

CAPM with tax

In CAPM assumptions, there is no tax in the market. In fact, investors' returns are calculated as follow*:*

$$E(R_i) = \frac{(P_1 - P_0) * (1 - T_c) + DIV * (1 - T_i)}{P_0} \quad (3)$$

$E(R_i)$: Expected return of stock i.

P_0 : Stock price at time 0.

P_1 : Stock price at time 1.

T_c : Tax rate on capital gain.

T_i : Tax rate on dividend.

If the investors have to bare the tax burden, this will cause differences between CML and SML among the investors.

3.3. Fama French Three-factor model

3.3.1. Findings of Fama and French

Capital asset pricing model CAPM uses single factor beta to compare a portfolio with market portfolio. R-squared measures significance level of regression function in CAPM measuring change rate of stock returns from changes in its beta. However, Eugene Fama and Ken French (1992) found that adjusted R-squared keeps still increasing, meaning that it is necessary to add more variables into the model to have more suitable R-squared.

Fama and French realized that average stock returns during the period of 1963 –

1990 in the US could not be explained by beta of CAPM. Fama and French began to observe two categories of stock which were better than the whole market. The first was small stock or stock of small capitalization companies. The second was the stock of companies which had high BE/ME ratio (or it was called value stock, and conversely it is called growth stock).

Then, they added two factors into CAPM to reflect sensitiveness of the portfolios to these factors. Fama and French (1993) identified a model with three risk factors which can affect stock returns. Those are market factor (RM – Rf), size factor (SMB) and factor relating to book value to market value ratio BE/ME (HML).

3.3.2. Fama French Three-factor model

Fama and French used time-serie regression approach of Black, Jensen and Scholes (1972) with a model:

$$E(R_i) = R_f + \beta_i * [E(R_M) - R_f] + s_{i*}E(SMB) + h_{i*}E(HML) \quad (4)$$

R_i is return of stock i.

R_M is market return.

R_f is risk-free rate.

SMB is average return of small capitalization portfolio minus average return of big capitalization portfolio.

HML is return difference between value stocks and growth stocks.

β_i, s_i, h_i are variables reflecting the factors' sensitiveness. Specifically, βi is also called three-factor β (to distinguish with β of CAPM).

Variables in model

Fama French model indicates that outstanding return of stock ($R_i - R_f$) is contributed from outstanding market return [$\beta_i*(R_M-R_f)$] plus size premium (s_i*SMB) and value premium (h_i*HML).

Abnormal market return: difference between market return and risk-free return is sometimes called market premium or abnormal market return, or an increase of returns causing by market risks. This factor is the same to what in CAPM.

Size premium: SMB (Small minus Big) measures an increase in profit when investing in small capitalization companies. This additional profit is sometimes called size premium, meaning the profit leading from company size.

In fact, data of SMB is calculated by average return of portfolio including 33% small capitalization (size) stocks minus average return of portfolio including 33% big capitalization (size) stocks. A positive SMB indicates that small size stocks is always better (higher stock return) than big size stocks. A negative SMB indicates the opposite: big size stocks are better than small size stocks.

Value premium: HML (High minus Low) measures additional profit of investors when investing to high BE/ME company stocks – or value stocks. HML is also called value premium, meaning an additional return coming from investing to value stocks. HML is calculated by average return of portfolio including 50% highest BE/ME stocks minus average return of portfolio including 50 lowest BE/ME stocks. A positive HML indicates value stocks are better than growth stocks. Conversely, a negative HML implies that growth stocks are better value stocks.

4. THE FACTORS CURRENTLY AFFECTING ON STOCK PRICE IN VIETNAM STOCK MARKET

4.2. High growth rate

Vietnam is still an emerging stock market which has been exploited recently and got much potential. Vietnam stock market has not developed completely, therefore investors here might have chances to earn abnormal returns which could be higher than that in developed countries, especially investing in recently operated fields. In 2006, Vietnam stock market reached the highest growth rate in Asia – Pacific region with 145%, even overpassed the Shanghai market with growth rate being 130%. In early 2007, its growth rate was 46% - the highest growth rate in the word, particularly with outstanding returns, 100% within a month. Wildly growing market has influenced essentially on many domestic and foreign investors, security experts and even the market managements. Furthermore, even in difficult periods such as in 2008, investing in stock market could get higher returns than sending money to banks. According to the analysis reports of stock company Kim Eng, in 31/12/2008, VN- Index was at 316 point with average P/E 9.62, stock return was 10.4%. If 12 month saving interest rate was 8.1%, difference between investing in stocks and saving in banks was positive 2.3%. This difference made investing in stocks become more rational and interesting than saving in banks. Besides, according to report investigating investment funds operating in emerging countries of LCF Rothschild, by the end of 6/2009, average returns of funds running in Vietnam market increased 25% compared with that in the end of 2008. Specifically, return of Manulife fund, VF1 and VF4 in 6/8/2009 was 37.7%, 27.4% and 27.6% respectively. However, the market still contains much instabilities in market origins, process or pricing methods.

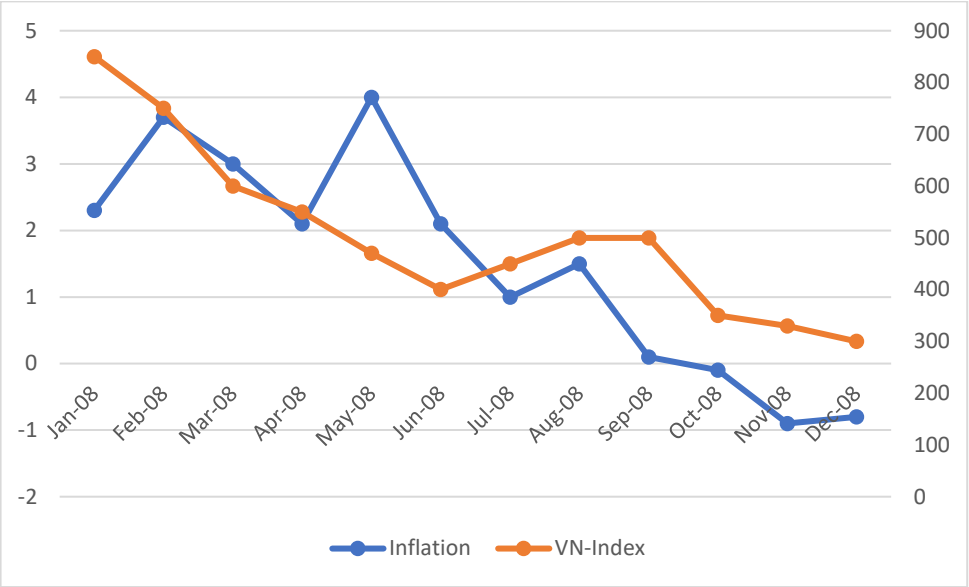
With such a highly profitable opportunity, stock market has become an attractive investment channel, attracting much attention from private investors, institutions. Therefore, this high growth rate would probably increase stock price.

4.3. Macro-economic factors: inflation – interest rate – exchange rate

Three main factors which could affect significantly on macro-economic are: exchange rate, inflation and interest rate. These three factors might affect widely and deeply on economics' parts from year to year, causing unstable situations in macro-economics. Inflation can bias financial statements, making the data comparison through years difficult and inaccurate. Interest rate is under huge influence of inflation. In a country, a higher inflation rate, a higher interest rate.

In the emerging markets like Vietnam, these factors have fluctuated dramatically, making investors difficult in forecasting (these factors are also the income data for investors' analysis) markets. This might lead to inaccurate forecast company's future operating results. For example, in 2008, Vietnam Government had to focus to solve the problems of inflation, trade deficit, exchange rate. Then, these problems continuously effected on macro-economic stability, financial institutions' operations, credits and people's lives and was reflected into stock market. This had huge influences on investors when VN-Index kept breaking through support threshold and making new bottoms. Not only stock index, but also capital allocation through stock market decreased dramatically, about 75% - 85% comparing to the previous year.

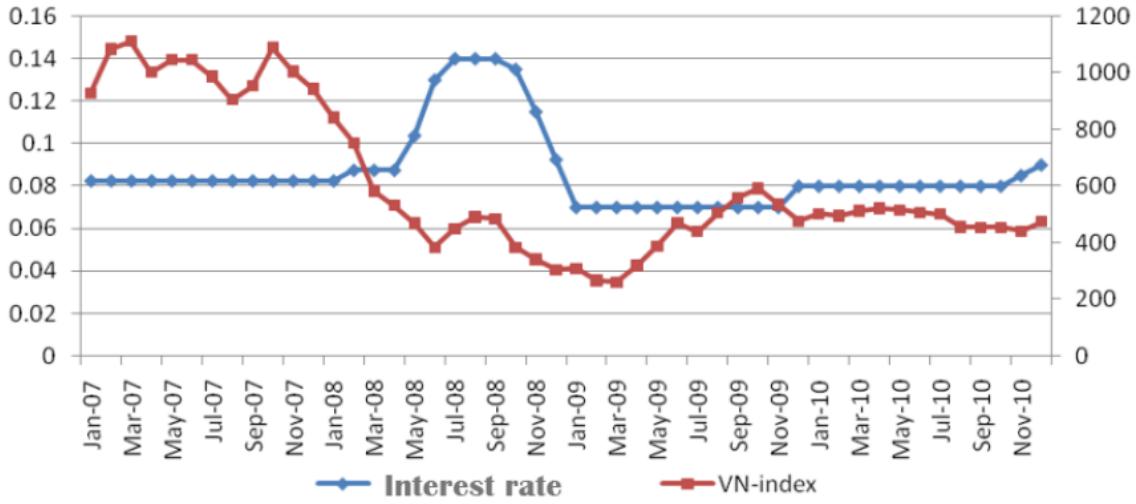
Chart 2: Inflation and VN-Index in 2018



Looking at the chart, we can see that when the government's inflation controlling policies worked, inflation rate felt down leading stock market be less active and VN-Index plummeted.

When inflation rate increases, costs of capital will increase consistently with the increase of price. Therefore, banks' deposit rates will increase leading to the increase of lending rate. It affects personal consuming behaviors, business plans, increasing business costs, decreasing incomes, and finally making stock markets less attractive to investors. Interest rate relates negatively to stock prices.

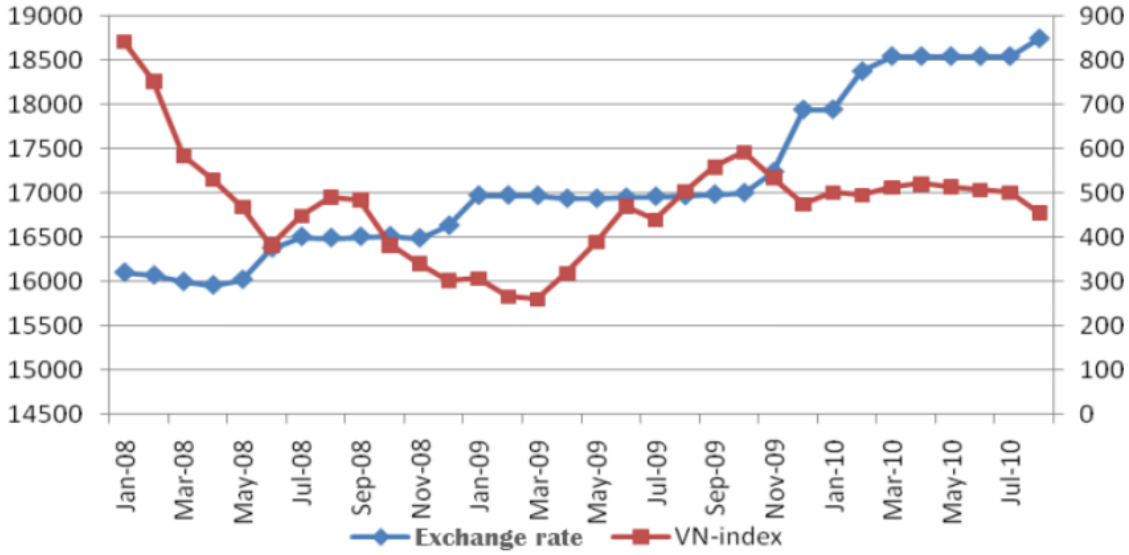
Chart 3: Interst rate and VN-Index



Looking at the chart above, we can see clearly that during the period of 7/2008 to 1/2009, when central bank applied high basic interest rate, VN-Index decreased dramatically, because at that time, investing to banks could be more profitable than investing to stock markets.

When exchange rate can reflect accurately the difference between two countries' inflation rates (or Purchasing Power Parity PPP exists), the value of the real money is not affected by changes in exchange rate. But in fact, especially in short term, it is difficult to happen because in emerging markets, exchange rate fluctuates very fast and strongly. When exchange rate increases, local currency tends to decrease leading a wave of foreign currency running to Vietnam. This can make an increase in stock investments, then raising the stock price and inversely when exchange rate decreases.

Chart 4: Exchange rate and VN-Index



4.4. Asymmetric Information

Incomplete and not smooth information for all investors: Vietnam stock market is weak form efficiency according to market efficiency theory (Quang Hung Nguyen, 2013), information has not been reflected completely in the price. This is also a good opportunity for investors with good source of information can exploit their own advantages. Unlike many developed economies, emerging market like Vietnam has big companies or huge corporations which can control big part of the market. In these companies and corporations, family members or relatives' ownerships account for 30% - 50% the amount of public stocks. Therefore, dividend policy also effects significantly on minority shareholders. When a company has a problem, it also affects essentially the others and the whole economy, its stock price will fall down leading the VN-Index down as well.

4.5. Government policy

A big problem in emerging countries is the interruption of governments by

conducting administrative methods and changing constantly in policies, effecting business operations. Most of these policies have been set to control market movements, decreasing growth rate when market was on strong uptrend and hard to control.

One of those policies is regulation on compulsory reserves. When the banks' monetary bases decrease because of government's tight monetary policy, commercial banks must adjust their outstanding loans limits. Money supply from banks decreases, amount of money being borrowed to invest to stock is lessen. Therefore, then money flow into stock market can be prohibited, making stock price fall. Besides, there have been still shortcomings in the implementation process of Security Laws. All of factors above together with government's inefficient policies have caused difficulties for investors in valuating stocks in emerging markets.

4.6. Herd behaviors

Financial markets always are driven by greed and fear. The biggest markets are the bustling markets where there is existence simultaneously of greed and fear. Specifically, the views of sellers and buyers are different. Sellers expect the price will decrease when buyers expect the price will increase. Either sellers or buyers can be right but the excitement of market can be triggered through sellers and buyers' attitudes. The recently vibrant Vietnam stock market partly reflects that truth.

Indeed, the overheating growth of Vietnam stock market in 2007 attracted much attentions from both local and foreign investors. There were many reasons for Vietnam Stock market's overheating growth. There was a debate that the market was driven by foreign investors, inversely there was also a view that the main reason was because of involvement of too many local investors. However, most agreed that the main reason was because of herd behaviors of local investors who were lack of knowledge and personal expectations. Inherent human psychology becomes stronger when people must make decision in an incomplete environment,

low quality information and existing information transparency limits. Once investors do not believe in quality and transparency of information, in combination with limited ability of analyzing information, they usually intend to imitate the others' actions in the market. A constantly unreasonable herd behaviors in a given-market could manipulate the stock price too far from its basic value, causing instability in stock price.

5. EFFICIENCY MARKET HYPOTHESIS AND VIETNAM STOCK MARKET.

Efficiency market hypothesis has been one of the huge interests of many researchers for a long time. While there are many researchers supporting that stock market is efficient, others think that it is inefficient (Monbarek et al. 2008). Efficiency market hypothesis is one of the vital hypotheses of modern financial theory. Studying the market efficiency, Magnusson and Wydick (2002) suggested that movements in a market need to be characterized by a random walk based on current available information.

Efficiency market hypothesis assumes that all available information which is fully reflected in stock prices in any points of time is the best estimation for stock prices (Malkiel and Fama, 1970). Efficiency market hypothesis depends on 3 following conditions: no transaction fees, public and available information, and current stock price totally reflect all available information. However, Malkiel and Fama (1970) believed that the infringement of these 3 conditions does not necessarily imply an insufficient market because of a competitive market. Based on the identification of available information, efficient market hypothesis is categorized into 3 levels namely weak-form efficiency, semi-strong form efficiency and strong-form efficiency. Weak-form efficiency states that future stock prices cannot be predicted by analyzing historical prices because all this information has been fully reflected in present stock prices (Fama, 1991). Semi-strong efficiency holds for markets in which all available information is publicly reflected in current market price. Finally, strong-form efficiency states that stock prices reflect all available and private information. Accordingly, it is impossible to use internal information, fundamental analysis and technical analysis to earn an excess return in an efficient market.

Efficiency market hypothesis has been studied in both developed and emerging markets. While many researchers have studied efficiency market hypothesis in developed countries, others believe that there is a need to conduct such studies in emerging markets (Mobarek et al. 2008). In emerging markets, empirical studies

mainly focused on the lowest level of efficiency market hypothesis – weak-form market efficiency. If found evidences cannot support for weak form market efficiency, they will support for higher level of efficiency market hypothesis – the semi-strong and strong efficiency market (Wong and Kong, 1984).

Vietnam stock market with main representative is HoChiMinh Stock Exchange (HOSE) is one of the emerging stock markets. HOSE's first trade started in July 28th 2000 with only 2 listed companies are Saigon Cable Telecommunication Material Joint Stock Company (SAM) and Refrigeration Electrical Engineering Joint Stock Company (REE). After a short time, Vietnam stock market has been significantly increasing in quantity of listed company, market capitalization and trade volume. Other hands, it has been getting through many fluctuations. Vietnamese Stock Index (VN-Index) reached its peak in March 2007 but then declined. After that event, there was a significant decrease in investors trust in Vietnam stock market. The market has only gained investors trust back in the middle of 2009.

Hence, studying the efficiency of Vietnam stock market is necessary. Khoa and Jian (2014) used autocorrelation test, runs test and variance ratio test with VN-Index data collected from its first trade in July 28th 2000 to July 28th 2013. They expected the weak-form efficiency hypothesis would hold for Vietnam stock market. Unfortunately, weak-form efficiency hypothesis did not hold for Vietnam stock market. Besides, Vietnam stock markets has haven noticeable improvements in all aspects. Vietnam stock market investors have become more professional in their investment.

6. TEST OF APPLICABILITY OF CAPM AND FAMA FRENCH MODEL IN VIETNAM

6.2. Conditions to apply the models

The current situation of Vietnam stock market shows that it is necessary to apply the modern financial models in identifying stock returns and risks. There are many models, however, to choose a model which can be applied simply and efficiently in Vietnam stock market is true art. Responding these two criteria, simple and efficient, we can count on two famous models, Capital asset pricing model CAPM and Fama-French three-factor model. Currently, Fama- French model has not been investigated reliably about the ability to apply in Vietnam Stock market. Meanwhile, studying and applying CAPM in Vietnam have been conducted by many researchers and showed that there were many limitations due to estimating beta from inaccurate historical time-series data about stock price and market index. This is because of:

* VN-Index could not present for market portfolio.

* There was not information about a company if that company was not public on the official market or transacting price on OTC was not announced.

* Some companies were public but their public period is not long enough to estimate Beta.

* Some transactions were not running continuously and price volatility was limited by “spreading regulation” which effected on the data significance.

Therefore, besides understanding meaning of the model, it is more important to know how to apply those models specifically to every country and every market. In Vietnam Stock Market, particularly in Ho Chi Minh City Stock Market HOSE, to apply this model, we should acknowledge the following factors:

* To measure exactly Beta, we should collect stock prices in a long time and with a big number. In fact, in most of previous studies, stock data was only observed in a short time. The number of public companies was small, company size was not big enough, investors were lack of experience, price fluctuated and was affected enormously by government policies. In this study, I collect data of 200 stocks from 1/2012 to 12/2015 on HOSE which may present for Vietnam Stock Market.

* Market capital should be big enough to be applied in this model. In the past, transaction amount and market capital were relatively low. Specifically, market capital in 2002 was about 80 million US dollars, this number increased steadily to 51.2 thousand billion US dollars in 2015, accounting for 40% of GDP. This figure implies that with this high level of market capital, applying financial models into Vietnam Stock Market might be sufficient.

6.3. Methodology

To investigate the explanatory power of CAPM and Fama-French model in Vietnam Stock Market, the following tasks will be conducted:

6.3.1. Variables

Sorting Portfolio:

Stock portfolio will be constructed based on two factors, size and BE/ME ratio.

The size of company is measured by multiplying the monthly average stock price with the number of stocks every month. Then, we can measure the average size of every stock and average size of the whole 200 stock portfolio. If a stock has average size which is smaller the average size of portfolio, it will belong to the group “S”. If not, it will belong to group “B”.

The ratio BE/ME is measure by dividing company equity with company size. Then, a stock with 30% highest BE/ME will belong to group “H”, with 30% lowest will belong to group “L”, the left will belong to group “M”.

Therefore, we can build 6 portfolios based on 2 size factors and 3 BE/ME ratio factors. Those 6 portfolios will be called SM, SH, SL, BM, BH, BL. For instance, SM is the group including stocks with small size and medium BE/ME ratio. The same rule can be applied for other groups.

Measuring variables SMB and HML:

SMB (Small minus Big) presents for the risk relating to size factor. SMB is the difference between monthly average returns of three small company samples (SL, SM and SH) and three big company samples (BL, BM and BH).

SMB = Average returns of small companies minus one of big companies

$$= 1/3(SH+SM+SL) – 1/3(BH+BM+BL) \qquad (5)$$

HML (High minus Low) presents for the risk relating to effect of book value to market value on returns. HML is difference between monthly average returns of high BE/ME portfolios (SH and BH) and low BE/ME portfolios (SL and BL).

HML = Average returns of high BE/ME portfolio minus one of low BE/ME portfolios

$$= 1/2(SH+BH) – 1/2(SL+BL) \qquad (6)$$

Portfolio returns:

Monthly average returns of portfolio: Based on stock daily closed price, we can measure stock returns for 6 portfolios above. Because Vietnam Stock Market is still young, there is not enough data for measuring the annual returns. I do not choose daily returns because it might be affected by volatility. In this study, stock return is

measured monthly. Data is collected from 01/2012 to 12/2015, including 48 months. I use the following formula for every stock in the sample:

$$R_i = (P_t+1 – P_t)/ P_t \quad (7)$$

Then, monthly average returns for a portfolio is monthly average returns of all stocks in that portfolio.

Market return and risk-free return:

R_f is return gathered from no-risk investing which is measured by 5-year government bond risk. RM is market return which is usually chosen as index of the market where stocks are publicized. Then, I choose VN-Index figures for stocks on HOSE. RM will be calculated by the following formula:

$$R_i = (VnIndext+1 – VnIndext)/VnIndext \ (8)$$

6.3.2. Methodology

Correlation Analysis: We should identify the importance of each factors which are used in a same model, therefore, we must eliminate the relations among factors. Applying correlation analysis to determine relations between explainable factors. This analysis can be based correlation matrix.

Linear Regression: This regression will be conducted to every portfolio with Ordinary Least Square – OLS. However, running simultaneously three factors in one model is difficult to investigate each factor's effect on model, therefore, I use stepwise method to bring factors one by one into the model and eliminate insignificant factors. The regression equation is:

CAPM: $$R_i – R_f = \alpha + \beta (R_m - R_f) + e_i \quad (9)$$

Fama – French: $R_i - R_f = \alpha + \beta\,(R_m - R_f) + s_i\,SMB + h_i\,HML + e_i$ *(10)*

We regressed two equations above for 200 stocks, then for every portfolio SH, SM, SL, BH, BM, BL to investigate more specifically effect of each factor on stock returns.

6.4. Data

This study uses close-price data of 200 public stocks on HOSE from 1/2012 to 12/2015. I regress series data on monthly returns of 200 stocks above (48 months).

Besides, data to measure company size and book value is collected from quarter financial statements of each company.

Data of risk-free rate is collected from coupon rate of 5-year government bond biddings listing on HNX (Hanoi Stock Exchange). This kind of bond is transacted the most on the market, so it is the most liquid on the market.

7. EMPIRICAL RESULT

7.2. Estimating expected returns with CAPM

7.2.1. Variable description

Table 1: CAPM variable description

	200 stocks	BH	BM	BL	SH	SM	SL	$R_M - R_f$
Mean	-0.0034	-0.0095	-0.0086	-0.0051	-0.0011	-0.0035	-0.0037	-0.0139
Median	-0.004	-0.0144	-0.0131	-0.0087	-0.0039	-0.008	-0.0064	-0.0145
Max	0.1012	0.1995	0.1587	0.0924	0.1147	0.1119	0.0972	0.0802
Min	-0.1210	-0.1693	-0.1694	-0.1059	-0.1241	-0.1225	-0.1079	-0.1176
Std. Dev.	0.0536	0.0683	0.0666	0.0479	0.0573	0.0559	0.0488	0.0479

The table above describes some parameters of the whole sample and 6 portfolios such as average return, maximum, minimum, standard deviation. Especially, the average returns of all portfolios were negative in the study period.

7.2.2. Empirical result

Table 2: Empirical results for CAPM

This table presents empirical result for CAPM. The linear regression in OLS method, with market risk premium $R_M - R_f$ as independent variable and $R_i - R_f$ as dependent variable. The regression is conducted as the following formula: $Ri - Rf = \alpha + \beta\ (Rm - Rf) + e$, for both every portfolio and the whole sample. *, **, *** indicates the significance level of coefficients at 10%, 5% and 1% respectively.

Independent Variable	Dependent Variable	A	β	R^2	Average R^2
R_M-R_f (Market risk premium)	200 stocks	0.003643 (0.7188)	1.066123** (0.0461)	0.905652	0.72995
	SH	0.007724*** (0.0000)	0.007724 (0.4118)	0.000003	
	SM	0.003877 (0.7830)	1.080649*** (0.0000)	0.853542	
	SL	0.001918 (0.9224)	0.960976*** (0.0000)	0.886809	
	BH	0.001019 (0.7604)	1.307779*** (0.0000)	0.839874	
	BM	0.001659 (0.2380)	1.289349*** (0.0000)	0.86362	
	BL	0.000688 (0.2210)	0.967476*** (0.0000)	0.93586	

Firstly, I run regression on all sample of 200 stocks receiving R2, 90.56%. However, the statistic coefficients are only 95% reliability. Then, I conduct regressions for each portfolio.

These portfolios are classified based on size and BE/ME ratio. In 6 portfolios, there is only portfolio SH which contains small and high BE/ME stocks having insignificant coefficient. The left 5 portfolios have relatively good significance. Market premium can explain from 83.98% to 93.58% changes in returns with 99% significance. Average R-squared of 6 portfolios is 73%.

7.2.3. Autocorrelation test

Because the observed sample in this study was 48 moths (n>30), I use Breusch – Godfrey (BG) to test autocorrelation in residual of regression model. With hypothesis H_0: $\rho_1 = \rho_2 = ... = \rho_n = 0$, meaning that there is no autocorrelation between residuals ε_i.

As noticed, we have the results of BG test for each portfolio with lags 1, 2, 3 respectively. Choosing significance level $\alpha = 0.01$, we compare Obs*R-squared from BG test respectively with $\chi 20.01(1) = 6.5$, $\chi 20.01(2) = 9.2$, $\chi 20.01(3) = 11.3$. We notice that there is only portfolio SH in 6 portfolios having Obs*R-squared bigger than Chi-squared distribution (26.89 > 6.5, 27.88 > 9.2, 31.27 > 11.3). Therefore, we deny the hypothesis H_0, meaning that there was autocorrelation.

In 6 portfolios, there is only 1 portfolio having autocorrelation. So, we can conclude that regression coefficients with OLS is reasonable. R-squared from the regression above is significant. The details of regression are presented in Appendix.

7.2.4. Heteroskedasticity Test

Then, I use White test to investigate heteroskedasticity in the residuals of regression models. With the hypothesis H_0: $\alpha 1 = \alpha 1 = ... = \alpha n = 0$, meaning that there is no heteroskedasticity. Results from White Heteroskedasticity Test are below:

Choosing significance level $\alpha = 0.01$, searching Chi-square distribution table with $\alpha = 0.01$ and slope df = 1, we have $\chi 20.01(1) = 6.5$.

Comparing the Obs*squared with $\chi 20.01(1)$, we notice that there is only BH portfolio having Obs*squared bigger than $\chi 20.01(1)$ (14.75>6.5). Therefore, we deny the hypothesis H_0, meaning that there is heteroskedasticity. In 6 portfolios, there is only one portfolio having heteroskedasticity, so we can conclude that

regression coefficients with OLS above are reliable and R-squared is completely significant. The details of regressions are presented in Appendix.

7.3. Estimating expected returns with Fama French three-factor model

7.3.1. Variable description

Table 3: Variable description

	200 stocks	BH	BM	BL	SH	SM	SL	R_M-R_f	SMB	HML
Mean	-0.0034	-0.0095	-0.0086	-0.0051	-0.0011	-0.0034	-0.0037	-0.0139	-0.0049	-0.0009
Median	-0.0040	-0.0144	-0.0131	-0.0087	-0.0039	-0.0080	-0.0064	-0.0145	0.0023	-0.0031
Max	0.1012	0.1995	0.1587	0.0924	0.1147	0.1119	0.0972	0.0802	0.0699	0.0642
Min	-0.1210	-0.1693	-0.1694	-0.1059	-0.1241	-0.1225	-0.1079	-0.1176	-0.0688	-0.0397
Std.Dev	0.0536	0.0683	0.0666	0.0479	0.0573	0.0559	0.0488	0.0479	0.0224	0.0207

Investigating the table above, we can see that 3 portfolios of small companies had bigger average returns than ones of big companies. The average value of stock returns varies from -0.00374 to -0.00113 for small company stocks and from -0.00947 to -0.00506 for big company stocks. Mean of SMB is also negative, showing that there is a negative relation between size and returns.

Investigating HML factor, we notice that mean value of HML was also negative. This means that there is a negative relation between BE/ME ratio and stock returns. In other words, growth companies have bigger returns than value companies. This finding is opposite to one of Fama-French (1992) who implied that there was a positive relation between BE/ME ratio and returns.

7.3.2. Multicollinearity test

We have correlation matrix between independent variables in Fama-French model as the following:

Table 4: Correlation matrix

	HML	R_M-R_f	SMB
HML	1	0.543524	-0.32026
R_M-R_f	0.543524	1	-0.30818
SMB	-0.32026	-0.30818	1

Table 4 shows that absolute values of correlation coefficients vary in [0.32 – 0.54] and are still lower than 0.8, which can confirm reliably possibility of multicollinearity. However, this correlation level is not too low, therefore I conduct some sub-regressions to recheck.

Regressing explainable variables respectively, we have results in the following table:

Table 5: Regressing explainable variables

	R^2	F-statistic	$F_{0.01}$ (1.45)
SMB and HML	0.08262	5.142793	7.77
SMB and R_M-R_f	0.074866	4.72252	7.77
HML and R_M-R_f	0.0095417	8.38687	7.77

Comparing the results from F-statistic, we can see that there is only regression between HML and (RM – Rf) having F-statistic bigger than 7.77, therefore we can deny hypothesis H0: R2=0, meaning that factor HML and (RM – Rf) might explain each other. However, this sub-regression has very low R2, only 0.95% or the influence level between these two factors was insignificant. Therefore, we can bring simultaneously all of three variables into a same model.

7.3.3. Empirical result

Table 6: Empirical result for Fama French three-factor model

This table presents empirical result for Fama French three-factor model. The linear regression in OLS method, with market risk premium $R_M - R_f$, size factor SMB, value factor HML as independent variables, $R_i - R_f$ as dependent variable. The regression is conducted as the following formula: $R_i - R_f = \alpha + \beta (R_M - R_f) + s_i SMB + h_i HML + e_i$, for both every portfolio and the whole sample. *, **, *** indicates the significance level of coefficients at 10%, 5% and 1% respectively.

Independent variable	Dependent variable	α	β	s_i	h_i	R^2	Average R^2
SMB	200 stocks	-0.0097 (0.1205)		-0.2982 (0.5014)		0.0155	0.08923
	SH	0.0078*** (0.0000)		-0.0088 (0.8240)		0.2294	
	SM	-0.0106 (0.2150)		-0.1152 (1.1440)		0.0021	
	SL	-0.0106 (0.2760)		-0.1848 (0.2831)		0.0072	
	BH	-0.0106 (0.0230)		-1.333*** (0.0000)		0.1910	
	BM	-0.0093 (0.8400)		-1.4102 (0.1670)		0.2261	
	BL	-0.0095 (0.2610)		-0.6746** (0.0410)		0.0996	
HML	200 stocks	-0.0098 (0.2610)			1.6151*** (0.0000)	0.3882	0.32385
	SH	0.0077*** (0.0000)			-0.0094 (0.7110)	0.0091	
	SM	-0.0097 (0.2815)			1.598*** (0.0000)	0.3486	
	SL	-0.0103* (0.091)			1.3194*** (0.0000)	0.3122	
	BH	-0.0148** (0.0325)			2.6181*** (0.0000)	0.6287	

	BM	-0.0145* (0.0812)			2.0406*** (0.0000)	0.404	
	BL	-0.0118* (0.0632)			1.1348*** (0.0000)	0.2408	
SMB and HML	200 stocks	-0.0107* (0.0542)		0.2003 (0.3390)	1.6846*** (0.0000)	0.3945	0.35695
	SH	0.0078*** (0.0000)		-0.0129 (0.7601)	-0.0139 (0.3940)	0.0272	
	SM	-0.0116* (0.0752)		0.3985 (0.5070)	1.7362*** (0.0000)	0.3714	
	SL	-0.0113 (0.4276)		0.2290 (0.5830)	1.3988*** (0.0000)	0.3221	
	BH	-0.0119 (0.2381)		-0.6224** (0.0421)	2.4023*** (0.0000)	0.6661	
	BM	-0.0103* (0.0763)		-0.898*** (0.0000)	1.729*** (0.0000)	0.4864	
	BL	-0.01* (0.0612)		-0.3776 (0.3351)	1.0039*** (0.0000)	0.2685	
(R_M-R_f) and SMB	200 stocks	0.0023 0.7601	1.1305*** (0.0000)	0.4466*** (0.0000)		0.9371	0.76101
	SH	0.0078*** (0.0000)	-0.0015 (0.2372)	-0.0098 (0.2391)		0.0105	
	SM	0.0019 (0.3412)	1.1757*** (0.0000)	0.6594*** (0.0000)		0.9165	
	SL	0.0005 (0.8402)	1.0324*** (0.0000)	0.4953*** (0.0000)		0.9335	
	BH	0.0025 (0.5831)	1.2327*** (0.0000)	-0.521*** (0.0000)		0.8663	
	BM	0.0035 (0.9221)	1.2*** (0.0000)	-0.619*** (0.0000)		0.9031	
	BL	0.0008 (0.3421)	0.9616*** (0.0000)	-0.0411 (02840)		0.9362	
(R_M-R_f) and HML	200 stocks	0.002720 (0.3852)	0.974666*** (0.0000)		0.389347*** (0.0000)	0.921548	0.75931
	SH	0.0078*** (0.0000)	0.003 (0.2106)		-0.0132 (0.1240)	0.0127	
	SM	0.003 (0.3248)	1.0009*** (0.0000)		0.3391** (0.0342)	0.8646	

	SL	0.0015 (0.7542)	0.924*** (0.0000)		0.1573 (0.1956)	0.8899	
	BH	-0.0022 (0.1670)	0.9833*** (0.0000)		1.3815*** (0.0000)	0.9632	
	BM	0.00025 (0.7602)	1.1497*** (0.0000)		0.5947*** (0.0000)	0.8878	
	BL	0.0009 (0.5612)	0.9948*** (0.0000)		-0.1163 (0.1880)	0.9376	
(R_M-R_f), SMB and HML	200 stocks	0.00089 (0.7736)	1.0216*** (0.0000)	0.5266*** (0.0000)	0.5129*** (0.0000)	0.9637	0.79020
	SH	0.0078*** (0.0000)	0.0019 (0.5207)	-0.0123 (0.3425)	-0.0161 (0.7605)	0.0286	
	SM	0.0005 (0.9220)	1.0668*** (0.0000)	0.7393*** (0.0000)	0.5126*** (0.0000)	0.9408	
	SL	-0.0003 (0.3390)	0.9721*** (0.0000)	0.5396*** (0.0000)	0.2838*** (0.0000)	0.9433	
	BH	-0.0012 (0.7143)	0.955*** (0.0000)	-0.317*** (0.0000)	1.307*** (0.0000)	0.9726	
	BM	0.0022 (0.8415)	1.1009*** (0.0000)	-0.547*** (0.0000)	0.4664*** (0.0000)	0.9175	
	BL	0.0012 (0.8401)	0.9893*** (0.0000)	-0.0615 (1.1440)	-0.1308 (0.8400)	0.9384	

When regressing on every individual portfolio, variable SMB effected insignificantly on stock returns, R-squared is only 8.92%. Besides, most of coefficients are not significant statistically. While HML seems to effect more on stock returns with average R-squared 32.38% at 99% significance level and coefficients are significant. When regressing variable HML with all 200 stocks, we get bigger R-squared (38.82%), at the same significance level 99%.

Continuing the regression with the pairs of explanatory variables SMB – HML, (R_M-R_f) – SMB, (R_M-R_f) – HML, we have average R-squared for 6 portfolios 35.69%, 76.1% and 75.93% respectively with significance level 99%. Similarly, when regressing with returns of 200 stocks, R-squared increases higher than regressing with returns of every single portfolio, 39.45%, 93.71% and 92.15%

respectively.

When adding other variable into the model, R-squared increases obviously. With three-factor model Fama French, average R-squared of 6 portfolios is 79.02%, statistical significance at the 1% level. This R-squared is higher than that of CAPM, 73%. This result is consistent with the studies about CAPM and Fama-French at some developing countries over the world such as Thailand, Taiwan and India.

One acknowledgeable point from this regression is that with dependent variable being average return of SM portfolio which includes small and high BE/ME stocks, there are not statistically significant regressed coefficient. There are no variables in 3 variables of Fama French being able to explain returns of stocks belonging to this portfolio.

7.3.4. Autocorrelation test

Because the study sample is 47 months (n>30), I use Breusch – Godfrey test (BG) to test autocorrelation in the model residuals. With the hypothesis H_0: $\rho_1 = \rho_2 = ... = \rho_n = 0$, meaning that there is no autocorrelation between residuals ε_i.

We have BG test results for each portfolio with lag level 1, 2, 3 respectively in the following. With significant level at $\alpha = 0.01$, we compare Obs*R-squared from BG test with $\chi^2_{0.01}(1) = 6.5$, $\chi^2_{0.01}(2) = 9.2$, $\chi^2_{0.01}(3) = 11.3$ respectively. We can see that among 6 portfolios, only portfolio SH had Obs*R-squared bigger than Chi-squared distribution (26.71 > 6.5, 27.37 > 9.2, 31.89 > 11.3), therefore we deny the hypothesis H0, meaning that there is autocorrelation. In 6 portfolios, there is only one portfolio with autocorrelation, so we can conclude that regression with OLS method is statistically significant. The details of regression are presented in Appendix.

7.3.5. Heteroskedasticity test

In the following, I use White test to investigate heteroskedasticity in the residuals of regression models. With the hypothesis $H_{0:}\ \alpha_1=\alpha_2=...=\alpha_n= 0$, meaning that there is no heteroskedasticity. Results from White Heteroskedasticity Test are below.

Choosing significance level $\alpha = 0.01$, searching Chi-square distribution table with $\alpha = 0.01$ and slope df = 1, we have $\chi 20.01(1) = 6.5$.

Comparing Obs*squared with $\chi 20.01(3)$, we see that all 6 portfolios have Obs*squared < $\chi 20.01(1)$, so we accept the hypothesis H_0 or there is no heteroskedasticity. Therefore, we can conclude that OLS regression results above are consistent and R-squared is completely significant. Regression detail results are presented in Appendix.

7.3.6. Comparing results between models

As presented above, CAPM was invented to forecast stock returns through its beta. From the time this model was born, there have been many empirical studies arguing about its applying ability. However, with the study results in 1993, Fama and French built up the three-factor Fama – French model including: size factor, BE/ME factor and market factor (from CAPM). This model can be considered as combining successfully previous studies results, including also results from the famous studies for CAPM. Otherwise, this model also has been studied individually empirically in many countries, also in many emerging economies such as India, Korea, Thailand, Taiwan. Most of these studies supported for the role of three factors in explaining stock returns. Particularly in Vietnam, investigating Fama French model in Vietnam Stock market from January 2012 to December 2015 with 200 stocks showed that three-factor model seems to be potential to apply in Vietnam Stock Market. The regression shows that R-squared of Fama French model 79.02% is higher than that of CAPM, 73%.

7.4. Limitations

Beside of noticeable results above, this study still has some following limitations:

About the model, Fama French is used as a main studied model. However, this three-factor model also itself has drawbacks. This model seems to only focus on the origin of profit rather than its risks.

Otherwise, Fama French is the same as others, which are only conducted properly when all investors have the same information and information is transparent. However, Vietnam Stock Market is still running at very low sufficient level which can make chance for speculators who can access to information the earliest to earn huge profit.

About data, Vietnam Stock Market has only been running for over 10 years, the number of public companies is not big enough, and business field is also not plentiful. Besides, this study is conducted only with data of 200 companies from 01/2012 to 12/2015. In addition, this study only focuses on one of two main markets in Vietnam, HOSE but not mentioning HNX (Hanoi Stock Exchange) yet.

8. CONCLUSION

In this thesis, the data sample consists of 200 public stocks from HOSE during the time period of 48 months from 1/2012 to 12/2015. The data was collected and sorted into 6 portfolios including SH, SM, SL, BH, BM and BL. Several regressions were conducted to test the applicability of CAPM and Fama French Three-factor model in Vietnam stock market. There are three hypotheses being stated in this thesis:

Hypothesis 1: CAPM is significant in Vietnam stock market.

Hypothesis 2: Fama French Three-factor model is significant in Vietnam stock market.

Hypothesis 3: Fama French Three-factor model is better than CAPM in explaining stock returns in Vietnam stock market.

According to the empirical results in Table 2 and Table 6, both models are economically significant in explaining stock returns in Vietnam stock market. By comparing the adjusted R-square of both model regressions, the study results indicate that Fama French three-factor model is more significant than CAPM in explaining stock returns. In three-factor model, market risk premium factor affects the most on returns, then followed by value factor (HML), and finally size factor effects the worst on returns. These finding are consistent to the previous studies about asset pricing models. Sattar (2017) studied the effectiveness of CAPM and Fama French Three-factor model in explaining excess return in Dhaka Stock Exchange by analyzing five publicly listed firms of Cement Industry over 10 years period of 2004 – 2014. By comparing the adjusted R-squared after running cross sectional regression of the observed panel data, Sattar concluded that Three-factor model is superior over CAPM in predicting stock excess return variations in Dhaka stock exchange. Or Al-Mwalla and Karasneh (2011) tests the ability of Fama & French Three-factor model to explain the variation in stock rates of return over the

period from June 1999 to June 2010 in Ahman stock market. They concluded that Fama & French Three-factor model provides a better explanation to the variation of stock rates of returns than the CAPM. Alves (2013) compared the Fama French model and CAPM with international evidence. The study mainly focused on the period from 1990 to 2003 with the data being downloaded from Datastream (DS) including a significant number of firms from several European Monetary Union members. Alves (2013) advised using Fama & French Three-factor model for small and high book to market firms.

Finally, this thesis also has a very huge drawback because of the data sample. The restriction of data in Vietnam Stock Market has put a big challenge onto this thesis. Probably, a wider and longer data could make a huge difference in the results to this thesis. Perhaps, when Vietnam Stock Market becomes more developed in the future, this data disadvantage can be fixed and we will have a better test in the effectiveness of CAPM and Fama French model in Vietnam.

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APPENDIX

SH				
Lag = 1	F-statistic	58.859	Probability	0.000000
	Obs*R-squared	**26.8948**	Probability	0.000000
Lag = 2	F-statistic	31.3769	Probability	0.000000
	Obs*R-squared	**27.886**	Probability	0.000001
Lag = 3	F-statistic	27.8379	Probability	0.000000
	Obs*R-squared	**31.2727**	Probability	0.000001
SM				
Lag = 1	F-statistic	0.2268	Probability	0.63625
	Obs*R-squared	0.2410	Probability	0.62346
Lag = 2	F-statistic	0.12679	Probability	0.88124
	Obs*R-squared	0.2756	Probability	0.87139
Lag = 3	F-statistic	0.8851	Probability	0.4566
	Obs*R-squared	2.7945	Probability	0.42435
SL				
Lag = 1	F-statistic	2.0608	Probability	0.15819
	Obs*R-squared	2.1028	Probability	0.14702
Lag = 2	F-statistic	2.9083	Probability	0.06537
	Obs*R-squared	5.6001	Probability	0.0608
Lag = 3	F-statistic	2.7902	Probability	0.05213
	Obs*R-squared	7.8105	Probability	0.05001
BH				
Lag = 1	F-statistic	0.96603	Probability	0.33105
	Obs*R-squared	2.10286	Probability	0.31497
Lag = 2	F-statistic	2.90827	Probability	0.04556
	Obs*R-	5.6001	Probability	0.04308

	squared			
Lag = 3	F-statistic	2.79020	Probability	0.09651
	Obs*R-squared	7.81049	Probability	0.08936
BM				
Lag = 1	F-statistic	0.02109	Probability	0.88518
	Obs*R-squared	0.22524	Probability	0.88070
Lag = 2	F-statistic	4.07046	Probability	0.02405
	Obs*R-squared	7.48174	Probability	0.02373
Lag = 3	F-statistic	3.48035	Probability	0.02406
	Obs*R-squared	9.35773	Probability	0.02489
BL				
Lag = 1	F-statistic	3.001094	Probability	0.090214
	Obs*R-squared	3.001024	Probability	0.083212
Lag = 2	F-statistic	1.693827	Probability	0.195848
	Obs*R-squared	3.432374	Probability	0.179750
Lag = 3	F-statistic	1.36193	Probability	0.267500
	Obs*R-squared	4.16684	Probability	0.244003

Appendix 1: Autocorrelation test for CAPM

SH	F-statistic	0.2343	Probability	0.79211
	Obs*R-squared	0.4953	Probability	0.78064
SM	F-statistic	0.5551	Probability	0.578
	Obs*R-squared	1.1567	Probability	0.56084
SL	F-statistic	0.7151	Probability	0.49471
	Obs*R-squared	1.4797	Probability	0.47718
BH	F-statistic	10.0629	Probability	0.000252
	Obs*R-squared	14.7509	Probability	0.000626
BM	F-statistic	1.0383	Probability	0.362557
	Obs*R-squared	2.1183	Probability	0.34676
BL	F-statistic	0.3735	Probability	0.69049
	Obs*R-squared	0.7846	Probability	0.6755

Appendix 2: Heroskedasticity test for CAPM.

SH				
Lag = 1	F-statistic	55.3125	Probability	0.000000
	Obs*R-squared	**26.7148**	Probability	0.000000
Lag = 2	F-statistic	28.5931	Probability	0.000000
	Obs*R-squared	**27.3740**	Probability	0.000001
Lag = 3	F-statistic	28.1567	Probability	0.000000
	Obs*R-squared	**31.8959**	Probability	0.000001
SM				
Lag = 1	F-statistic	2.29347	Probability	0.13741
	Obs*R-squared	2.43362	Probability	0.11876
Lag = 2	F-statistic	1.15151	Probability	0.32617
	Obs*R-squared	2.49963	Probability	0.28656
Lag = 3	F-statistic	0.75321	Probability	0.52701
	Obs*R-squared	2.51309	Probability	0.47293
SL				
Lag = 1	F-statistic	3.93783	Probability	0.05378
	Obs*R-squared	4.20887	Probability	0.04473
Lag = 2	F-statistic	2.11475	Probability	0.13364
	Obs*R-squared	4.39651	Probability	0.11108
Lag = 3	F-statistic	1.37721	Probability	0.26362
	Obs*R-squared	4.40016	Probability	0.22137
BH				
Lag = 1	F-statistic	3.70236	Probability	0.06112
	Obs*R-squared	3.80748	Probability	0.05102
Lag = 2	F-statistic	1.84743	Probability	0.17053
	Obs*R-squared	3.88541	Probability	0.14331

Lag = 3	F-statistic	1.20613	Probability	0.31991
	Obs*R-squared	3.88923	Probability	0.27259
BM				
Lag = 1	F-statistic	0.43545	Probability	0.51292
	Obs*R-squared	0.48230	Probability	0.48738
Lag = 2	F-statistic	0.86067	Probability	0.43037
	Obs*R-squared	1.89387	Probability	0.38794
Lag = 3	F-statistic	1.14310	Probability	0.34340
	Obs*R-squared	3.71126	Probability	0.29477
BL				
Lag = 1	F-statistic	4.01609	Probability	0.05155
	Obs*R-squared	4.10196	Probability	0.04283
Lag = 2	F-statistic	2.17688	Probability	0.12631
	Obs*R-squared	4.51193	Probability	0.10477
Lag = 3	F-statistic	1.59946	Probability	0.21654
	Obs*R-squared	4.89458	Probability	0.17968

Appendix 3: Autocorrelation test for Fama French model

SH	F-statistic	0.527687	Probability	0.84490
	Obs*R-squared	5.346421	Probability	0.80313
SM	F-statistic	1.348626	Probability	0.25883
	Obs*R-squared	7.04803	Probability	0.24489
SL	F-statistic	1.46988	Probability	0.25986
	Obs*R-squared	7.90843	Probability	0.24584
BH	F-statistic	1.46985	Probability	0.21320
	Obs*R-squared	8.49065	Probability	0.20431
BM	F-statistic	0.89564	Probability	0.50746
	Obs*R-squared	5.56623	Probability	0.47345
BL	F-statistic	0.33740	Probability	0.91239
	Obs*R-squared	2.26413	Probability	0.89388

Appendix 4: Heteroskedasticity test for Fama French model