Compare the Three and Four and Five Factor Models of Pricing of Fama and French Capital Assets to Predict Stock Returns of Companies Listed in Tehran Stock Exchange

Mohammad Ali Afzali[1] , Dr. Mostafa Vaezi Monfared[2] *

[1]Department of Accounting, Master of Accounting, Damghan Branch, Islamic Azad University, Damghan, Iran.
[2]Department of Accounting, Assistant professor, Damghan Branch, Islamic Azad University, Damghan, Iran

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ABSTRACT

Objective: One of the basic criteria for decisions on the exchange is stock returns. Stock returns, alone, are having informational content and more actual and potential investors use it in financial analysis and forecasts. Many studies have been done on the relationship between risk and return. Fama and French purpose of the experiment was to know the relative importance of future stock returns, which at present, is different than the market value to their book value. **Methodology:** Fama and French, to predict stock returns were to work as a model became known three-factor model. In this model, the stock return was affected by three factors: beta, firm size and the ratio of book value to market value. In recent years, were presented and were studied three and four-factor model of Fama and French for evaluation pricing of capital assets and most recently, Fama and French also have provided their five-factor new model. The aim of this study was to compare the results of forecast three factor model and four-factor model and the five-factor model of Fama and French in Tehran Stock Exchange. **Results:** The results show that the five-factor model of Fama and French is a significant in Tehran Stock Exchange and in comparison the explanatory power of three and four and five factors models, the five-factor model was better than the three factor model and four factor model was better than the five factor model. **Conclusion:** So, using four factor models in financial analysis in Tehran stock exchange will result in the highest performance.

1. Introduction

In line with the government formulated plans and economic experts to Iranian economic growth and development, absorb and inject financial resources into economic units is one of the most important necessity. The need for participation of all people and society, both within the country and abroad to provide these financial resources is not any secret to anyone. On the one hand, to attract and encourage this people to invest and provide financial resources, provide tools to help in this decision is the important role. In fact, every investor, at first must obtain this trust and confidence, which in the first stage will be returned the capital and then expected returns to be able to decide to invest. Accounting and financial management are the courses that can provide these tools help to investors. One of the most important tools to predict the return on investment in securities are capital assets valuation models, which the most famous of these models is capital assets pricing model (CAPM).Another model in recent years gained a global dimension and has been attracted the attention of people active in the capital markets is a three factor model of Fama and French (1993). In many countries has been examined explanatory power of this model. This study is also an attempt however small in order to test of Fama and French model in explaining stock returns in Tehran Stock Exchange may help to increase confidence in financial instruments, in order to use them in the analysis of financial data of companies active in Iran's economy and obtaining optimal investment decisions (Jafari et al., 2013).

1.1 Problem Statement and the Importance of Research

Fama and French in 1993, to predict stock returns were to work as a model became known three-factor model. In this model, the stock return was affected by three factors: beta, firm size and the ratio of book value to market value. In the past two decades, many in research by effect of Fama and French have been used the three-factor models to study to explain the return on assets (Izadinia, 2014). The research can be divided into two categories: the first category are studies that have evaluated Fama and French three factor model in the Stock Exchange and in the initial selection imposed examined changes and, second, are studies that have been conducted with the aim of providing a more comprehensive model with the explanation of the highest efficiencies. These studies have created changes in variables Fama and French three factor model or have added new variables to it. Since determine the stock return and operating leverage has a key role in the decisions of economic actors on the capital market, the yield estimate based on variables that it estimated is simple has become the subject of fascination for this research (Narasimhan and Titman, 1993).

1.2 Theoretical Foundations

In recent years, has been done much research with a focus on the issue of capital structure and leverage ratios or the company's debt in Iran and this debate have studied the different angles and aspects. The ability of the company to identify potential funding sources, both internal and external resources to provide capital for investment and prepare an appropriate program is one of the main factors of growth and progress of each company. To optimize the capital structure, different financing identifying sources and fees for management decision making are made with regard to the future and has particularly important the maximization of corporate value. Methods of financing in Iran, according to its own limitations such as the impossibility of issuing bonds and external financing due to economic sanctions, distinguishes capital structure decisions of other countries. In addition, due to the existence of a conflict of interest between creditors and shareholders, financial crises and loans that are have different risks, there is no precise way, which can thereby, determine the amount of optimization of the structure of the capital.

1.3 Research History

Eslam Bigdeli and Shahsavani (2012), in research entitled assess the ability of model-based stock properties compared with Fama and French three factor model in explaining differences between stock returns of companies listed on the Tehran Stock Exchange began to review the ability of the model to explain the difference in the stock return over the period 2002 to 2007.The results of their study showed that market risk, alone, is not able to explain the behavior of stock returns, but the size of the company and the ratio of book value to market value, alone, are able to explaining stock returns. But if three factors are taken together are able to explain stock returns.

Eslam Bigdeli and Honardoust (2012), in Tehran Stock Exchange from 2001 to 2010, in research titled Fama and French three factor model and liquidity risk began to study the three factor model of Fama and French, in addition, the measure of market liquidity risk. The results are indicated effects of excess market return, firm size, and the ratio of book value to market value and significant non-operating market liquidity. Also, results showed that operating liquidity, Pasteur and Astamba market, and the use of variable market beta is due to an increase in explanatory power of Fama and French three factor model.

Shams and Parsaeian (2012), in Tehran Stock Exchange from 1999 to 2009, began to compare the performance of Fama and French and artificial neural networks in predicting stock returns in Tehran Stock Exchange. This study was conducted with two hypothesis, which the first hypothesis has compared the accuracy of the models in the prediction of monthly stock returns, and the second hypothesis has compared the accuracy of the models in the prediction of monthly returns, the six consists portfolio depending on the size and the ratio of book value to market value. The results of this study showed that there is a significant difference between the mean error models to predict stock returns and composed portfolios that this difference was to demonstrate the superiority of general regression neural network model on the model of Fama and French in forecasting stock returns and portfolios.

Fan and Yu (2013) began to compare Fama and French model and the model of Chen et al (2011), in 12th largest in the world. Chen and colleagues models are included market factors, investments and return on assets, which inspired from the Q theory. The results showed that the model of Chen et al. is the inclusion of explanatory power higher, as well, despite the fact that in the model of Chen et al., Alpha factor is still significant, but it was less than the model of Fama and French.

Fama and French (2012), in an article entitled (size, value and desire to past performance in international financial markets) investigated the relationship the three factors Fama and French (1993), Carhart (1997) four-factor model, and one-factor model, capital asset pricing with stock returns in four geographic regions, including North America, Europe, Southeast Asia, and Japan. The results were suggests high explanatory power offour-factor model in three points (excluding Japan), than other models including the capital asset pricing model and Fama and French model.

Artmann et al. (2012), examined the factors determining stock returns in Germany to test Fama and French three factor model and Carhart (1997) four-factor model. Their results based on the German stock exchange from 1963 to 2006, showed that Fama and French model is the ability to little explain in determining the average stock returns and Carhart model has a higher explanatory power, also, they came to the conclusion that, if in Carhart model instead of size, use of factor income shares to its price, is twice as much explanatory power of the model.

2. Materials and methods

2.1 Research Methodology

This research in terms of classification is based on the goal of applied research, and based on classified research, based on the nature is correlation research. The data collection tool in this study was the library method. The data examined in this study is derived from the Rahavard Novin software, and in this study have been used Excel software to sort the data. Also, according to existing functions in this software, some of the variables obtained using these functions. In addition, we use of statistical Eviews7 software, for data analysis and data estimation. To review research hypotheses, after the determination the normal distribution of data with the use of multivariate regression analysis were examined each of the hypotheses and to respond to the

hypothesis have been used regression testing. To find the model was used of multivariate linear regression method for panel data. The time span of this study is for 5 years from 2010 to 2014. According to perform sample limitations, this study has included 170 participants for the study.

The hypothesis of this study is as follows:

1. The five-factor model of Fama and French is significant in financial markets of Iran.

2. The five-factor model of Fama and French has a better explanatory power than the four-factor model of Fama and French.

3. The five-factor model of Fama and French has a better explanatory power than Fama and French three-factor model.

2.1.1 Operational Definition of Variables

The first hypothesis of this study is as follows that the five-factor model of Fama and French is significant in the context of Iran. To test this hypothesis, five-factor model of Fama and French is examined as follows:

$$(Ri - Rf)\, t = a1 + bi\,(Rm - Rf) + siSMBt + hi\,HMLt + riRMWt + CMAt + e_{it} \qquad (1)$$

The second hypothesis of this study is as follows that the five-factor model of Fama and French has a better performance than the four-factor model of Fama and French. To test this hypothesis, four-factor model of Fama and French is examined as follows:

$$(Ri - Rf)\, t = a1 + bi\,(Rm - Rf) + siSMBt + hi\,HMLt + riRMWt + e_{it} \qquad (2)$$

The third hypothesis of this study is as followsthat the five-factor model of Fama and French has a better performance than the three-factor model of Fama and French. To test this hypothesis, three-factor model of Fama and French is examined as follows:

$$(Ri - Rf)\, t = a1 + bi\,(Rm - Rf) + siSMBt + hi\,HMLt + e_{it} \qquad (3)$$

i= Rate of return without risk.

t = It is the difference between firm returns and rate of return without risk i, in month t.

(Rm - Rf) t = Difference between stock market returns and interest rate without risk (market factor, general index), which is the market rewards for risk taking, which is to calculate market returns, we use of the index of Tehran stock exchange.

SMBt = Factor stock returns risk, which is related to the size of companies and is equal to the difference between the average yield portfolio with small size, and the average yield portfolio with large size.

HMLt = Factor stock returns risk, which is related to the ratio of book value to market value at period t, which is equal to the difference between the average return on equity portfolio with the ratio of book value to high market value, and the average return stock portfolio with the ratio of book value to lower market value.

RMW = It is the difference between stock returns portfolios with strong and weak profitability.

CMA =Differences in portfolio returns conservative companies with aggressive companies, according to their behavior of investment.

2.1.2 Method of Determining the Independent Variables

Factor stock returns risk related to market (Rm - Rf) t: This variable is indicated explain factors of the risk of stock returns, which is explained by means factor market returns. Differences between market returns and interest rate without risk in (market factor). In order to calculate this variable, first it is necessary to obtain Rt and Rm.

Rf: Provisional interest rate, which is equal to the provisional interest rate of government bonds in period t.

Rm: It is equal to the total rate of return of Tehran Stock Exchange (General index), which is used to calculate this returns have been used yielding a cash return index and the price of the Tehran Stock Exchange (TEDPIX), which is as follows:

Cash output and price index or the same index of total revenue with the symbol TEDPIX, is calculated and published from March 1998, in Tehran Stock Exchange. Changes in this index is reflects the return on the stock and influenced from the price changes and return of cash payment. In other words, this indicator is indicating the total return obtained from investing.

$$Rm = \frac{TEDPIXt - TEDPIXt\text{-}1}{TEDPIXt\text{-}1} \qquad (4)$$

That has been used to obtain Rm, from the general index of Tehran Stock Exchange.

Risk factors of stock returns related to the SMBt size: Risk factors of stock returns, which are related to the size of companies, which is explaining stock returns by size factors company and is equal to the difference in average portfolio returns with small size and the average yield portfolio with large size.

Risk factors of stock returns related to the HMLt size: Risk factors of stock returns, which is related to the ratio of book value to market value in the month t, which is equal to the difference between the average yield portfolio with a book value ratio to the high market value and the average return on equity portfolio with the ratio of book value to lower market value.

Risk factors of stock returns related to the RMWt size: Risk factors of stock returns, which is related to the ratio of companies leveraged is explaining stock return, due to operating leverage and is equal to the difference in average portfolio returns with high leverage ratio and the average yield portfolio with lower leverage ratio. The leverage ratio is equal to the ratio of long term debt to total assets.

3. Discussion and results

3.1 Research Results

3.1.1 Findings of the First Hypothesis Test

The results of the first regression model showed that the five-factor model of Fama and French is significant in financial marketsof Iran ($F = 589.76$ and $0.001 > P$). The results showed that four variables of five predictor variables are affecting the dependent variable and can anticipate it. Determining model respectively of 0.674, that is high value and significant and has shown that these five factors could have contributed to the prediction of dependent variable. Therefore, it is accepted the first research hypothesis.

3.1.2 Findings of the Second Hypothesis Test

Compare the five-factor model of Fama and French with a four-factor model, in general, is showing the superiority of four-factor model. Because of that in the five-factor model, the number of four variables is affecting the dependent variable and is a variable ineffective, but in the four-factor model, all the independent variables are effective on dependent. Compare coefficient of determination shows that the coefficient of determination two models is almost equal, and despite the fact that five factor model is a 5 influencing variables in the model, this model coefficient of determination is almost identical with four models factor, which is consisted of four factors (coefficient of determination 0.674, for the five-factor model and determine the coefficient of 0.669, for a four-factor model).Akaike's information criterion, which is a measure, to measure the goodness of fit models indicate that the four-factor model, the amount of 0.479, and the five-factor is achieved, the amount of 0.527, which is smaller because the amount of Akaike's information criterion was to show from the fit better model, it can be concluded that based on Akaike's information criterion, four-factor model is a better fit than the five-factor model. Overall, the results show that the second hypothesis is not confirmed and four-factor model of Fama and French has a better explanatory power than the five-factor model.

3.1.3 Findings of the Third Hypothesis Test

Investigating the number of effective variables on the dependent variables shows that in the five factor model, the number four independent variables have a significant effect on the dependent variable, but three factor model, despite the fact that, all independent variables are significant on the dependent variable, but an independent variable in the five-factor model was effect on the dependent variable (RMW variable), in the three-factor model has been removed from the overall model, which is incorrect in terms of statistically, and five factor model including are four effective variables has superior of the three-factor model. Compare coefficients of determination shows that five factor model coefficient of determination is higher than three factor model. Determining factor of five factor model is equal to 0.674, and for three-factor model is the amount of 0.541, which shows that five factor model could have a greater role in explaining the dependent variable. Akaike's information criterion, which is a measure to measure the goodness of fit models shows that five factor model is the amount of 0.527, and the three factor model is the amount of 0.533, which is close to each other and in terms of this criteria fit both models is almost equal. Overall, the results suggest that verified the third hypothesis and five factor model of Fama and French has a better explanatory power than the three-factor model.

4. Conclusion

4.1 Research Suggestions

The results show that five factor model of Fama and French is significant in the Tehran Stock Exchange and in comparison, the explanatory power of three and four and five factors models, the five factor model is better than the three-factor model and four-factor model is better than five factor model. So apply the four-factor model is better than the other models.

4.1.1 Research Limitations

In doing any research, there are limitations that may be affected by the results of the investigation. In this study, lack of access to information of many companies and delete them from number of research samples and stop trading a lot of symbols that is including restrictions.

REFERENCES

Chen, C., Hung, W., & Cheng, H. 2011. Applying linguistic PROMETHEE method in investment portfolio decision-making, International Journal of Electronic Business Management, 9 (2): 139-148.

Eslam Bigdeli, G., & Shahsavani, D. 2012. Assess the ability of model based on features stock compared with Fama and French three-factor model in explaining the difference between stock returns of companies listed on the Tehran Stock Exchange, Journal of Accounting and Audit, 4 (13): 55-67.

Eslam Bigdeli, G., & Honardoust, A. 2012. Fama and French three-factor model and liquidity risk: evidence of Tehran Stock Exchange, investment knowledge quarterly, 1 (2): 71-93.

Izadinia, N. 2014. Compare the original model of Fama and French with Carhart four factor model in explaining stock companies listed on the Tehran Stock Exchange, Quarterly research Journal of asset management and financing, 2 (3): 17-28.

Jafari, M., Misaghi Faruji, J., Ahmadvand, Ali. 2013. Comparison pricing models, capital assets of three-factor Fama and French and artificial neural networks to predict the stock market, Journal of Economics and Business, 4 (5): 53-63.

Shams, N., & Parsaeian, S. 2012. Compare the performance of Fama and French model and artificial neural networks in predicting stock returns in Tehran Stock Exchange, Financial Engineering and manage portfolios magazine, 1: 14-21.

Artmann, S., Filter, P., & Kempf, A. 2012. Determinants of Expected Stock Returns: Large ample Evidence from the German Market. Journal of Business Finance & Accounting, 39 (5-6): 758-784.

Carhart, M. 1997. On Persistence in Mutual Fund Performance. The Journal of finance, 52 (1): 57-82.

Fama, E., & French, K. 2012 .Size, Value, and Momentum in International Stock Returns. Journal of Financial Economics, 105 (3): 457-4721.

Fama, E., & French, K. 1993. "Common risk factors in the returns on stocks and bonds". Journal of Financial Economics. 1: 33: 3–56.

Fan, S., & Yu, L. 2013. Does the Alternative Three-Factor Model Explain Momentum Anomaly Better in G12 countries? .Journal Of Finance & Accountancy, 12: 81-96.

Narasimhan, J., & Titman, S. 1993. Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, Journal of Finance, 1: 48-91.

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