European Online Journal of Natural and Social Sciences 2015; www.european-science.com
Vol.4, No.1 Special Issue on New Dimensions in Economics, Accounting and Management
ISSN 1805-3602

The Study of the Effect of Diversification of Products on Firm Performance in Tehran Stock Exchange

Halima Didar*, Somayeh Moshfeghi
Bandar Abbas branch, Islamic Azad University, Bandar Abbas, Iran
*E-mail: H.didar@gmail.com

Abstract

One of the models to predict the expected return on equity is capital asset pricing model, a single factor (CAPM). Because of the shortcomings of this model, three-factor model of Fama and French (1993) was proposed. This model has been tested in some countries. The main objective of this study was to evaluate the impact of diversification of products on productivity of companies in the Tehran Stock Exchange. For this study, two main sub-hypotheses and a theory were developed by using a statistical comparison of the two communities. The average return in companies with low product variety and diversity of products is highly significant. On the other hand, by using the equations of Fama and French it can be found that every time a variety of product was added to equations (coefficient of determination) and also the confidence equation increased. Thus, the hypothesis that "diversification increases the efficiency of the model and its ability to explain changes" was confirmed. When we examined the regression equations, except for one case, in other cases coefficients SMB were positive.

Keyword: Market risk premium, product variety, the ratio of market value to book value, Fama and French three-factor model

Introduction

In the late half of the twentieth century, due to the specialized companies' vulnerability to changes in the environment of rapid and unexpected "diversity", the essential foundation was changed for the growth and survival of the company. The increasing importance of diversity in explaining changes in the shape and profile of organizations and industries led to the development of a wide range of social science research in various fields. On the other hand, the optimal portfolio selection requires an estimate of the risk and return of a bond. Throughout the years, various models for risk assessment and portfolio returns have been proposed. The different models have been evaluated and the results demonstrated that the factors discussed in this model solely cannot explain the relationship between risks and return portfolios. That is why the idea of combining these factors was considered. So far, in this regard, Fama and French three-factor model is the most complete model.

Theoretical foundation of the study

Until now, several researches are conducted on the effect of various factors on the expected return on equity. Each of these studies has attempted to examine a number of factors affecting the efficiency of the public or their stock. Variety of factors includes market value, leverage ratio, $\frac{E}{P}$ size and ratio of book value to market value. Fama and French have used a multiple regression to examine the factors influencing their portfolio returns design (Fama and French, 1993).

Fama and French using the CAPM formula is presented below:

$$E(R_i) - R_f = b_i\big(E(R_M) - R_f\big) + s_i \times E(SMB) + h_i \times E(HML)$$

In this formula$E(R_i) - R_f$ refers to the returns in excess of the company's return on risk-free. The excess return is due to three factors. The first factor is that the market risk of premium factor

beta (β) is provided by the CAPM. ($R_{\mathrm{M}} - \mathrm{R_F}$)This factor is measured by the regression formula proposed by Fama and French which is called the market factor and is shown by MKT.

Second, the difference between the averages yields of the portfolio companies and the small and large portfolio of companies that is shown by SMB.

$$SMB = \frac{\left({}^{S}/_{L} + {}^{S}/_{M} + {}^{S}/_{H}\right)}{3} - \frac{\left({}^{B}/_{L} + {}^{B}/_{M} + {}^{B}/_{H}\right)}{3}$$

$\frac{S}{L}$ Firms that are small in size and their market value are lower than the book value.

$\frac{S}{M}$ Firms that are small in size and the ratio of their market value to the book value is medium.

$\frac{S}{H}$ Companies that are small in size and the ratio of their market value to the book value is high.

$\frac{B}{L}$ Companies that are large in size and the ratio of their book value to the market value is low.

$\frac{B}{M}$ Companies that are large in size and the ratio of their book value to the market value is moderate.

$\frac{B}{H}$ Companies that are large in size and the ratio of their book value to the market value is high.

The third factor which indicates the difference between the average yield of the portfolio companies with a high ratio of book value to market value and the portfolio companies with a market value is lower than the book value. Generally, the value is shown by HML.

$$HML = \frac{\left({}^{S}/_{H} + {}^{B}/_{H}\right)}{2} - \frac{\left({}^{S}/_{L} + {}^{B}/_{L}\right)}{2}$$

The regression formula of Fama and French (1993) namely three-factor model is used to predict stock returns in the form provided below:

$$R_i - R_f = a_i + b_i \times MKT + s_i \times SMB + h_i \times HML + \varepsilon_t$$

In this formula, a_i is the average abnormal return of stock and i is the theory of capital asset pricing model which is equal to zero.

b_i, s_i, h_i are respectively the market factors, size and value portfolios.

ε_i is zero return on a portfolio of assets (Davis, Fama & French, 2000).

Background of study

The operating efficiency as the fourth factor model of Fama and French is added to explain the effect of promoting future stock returns. Hypothesis testing results indicate a positive relationship between risk and average return on equity. The average return on equity ratio of book value is inversely related to market value. This relationship is stronger in small firms and weaker in large firms. In cases where the agent to be considered alone or in combination of book value to market value, the average stock returns are inversely related. In the article which was written by Abdul Eshragh Nia Jahromy and Nashvadyan "Fama and French three-factor model were tested in the Tehran Stock Exchange" by using the portfolio of the pricing model. The results suggest that the Fama and French three-factor model in the Tehran Stock Exchange outperformed the capital asset pricing model (CAPM).

Tehrani and Ahmadian conducted a study entitled "The relationship between risk and return of stock company manufacturing a variety of products with the Tehran Stock Exchange" and examined the relationship between different aspects of diversity by return and risk stock companies and concluded that almost tangible connection cannot be seen between any one of a variety of organizational efficiency and corporate risk.

Methodology

This study is an applied one. This study aims to apply the existing knowledge to provide a mechanism to disappear the specific needs. Tehran Securities are studied including 64 companies. Descriptive statistics of central tendency and dispersion parameters of the studied companies is used. Fama and French three-factor model was used.

Research hypotheses

The main hypothesis: Diversification has a positive effect on firm performance.

Alternative hypothesis:

The average return in companies with low product variety and diversity is highly significant.

Diversification increases the validity of the model and can explain the changes in efficiency.

Range of spatial and temporal investigation

The time period of study was from 2006 to the end of 2009. All companies listed in Tehran Stock Exchange with the necessary conditions were used in the model. These conditions are:

a. The number of trading days in a year: one of the most important factors for selecting the number of days is a company's stock which is traded in the market.

The company's logo to various causes over the years

This parameter is also of considerable importance in similar studies in other countries.

In this study, a company should have at least 100 days in order to be in a partnership model. b. To set up a company in the year model, all financial information should include a balance sheet and profit and loss statements and to be available before September.

c. Companies should be present in Tehran Stock Exchange at least one year before entering the model.

d. Because of the different financial investment companies and banks, as well as the need for coordination among the entries in this study and other similar studies in other parts of the world, so that the companies which were removed from the list of companies entering into the model, this study ignored the company's entry into the model. The number of companies in the period 2006 to 2009 based on the above conditions was 64 companies that were used as the sample.

Information extraction on variables

Library resources, including library research techniques, Tehran Stock Exchange, software outcomes of new and used www.IrBours.com site were used to gather the needed information:

a. The market risk premium is defined as the market risk premium on the market portfolio excess return over the risk-free rate of return.

Tehran stock market index of the web service collection was calculated based on the market return minus the index of the beginning of the end of the period divided by the beginning of the period. Index returns are risk-free interest rate declared accounts (17%) Government Bonds (Mojtahed Rad, 2006).

b. Product Diversification: The Company’s products are based on their financial statements. Firms with fewer than 10 products are regarded as a company with low diversity and firms with 10 or more products in a year, are considered as a company with a high diversity (ibid.).

c. The ratio of book value to market value of the product is divided by book value of the company's shares at the end of the financial year and the company's stock market value is obtained at the end of the year. Based on the research, companies should be divided into three categories: low, medium and high-categorized. Therefore, 30% of companies are classified as low, 40% as medium enterprises and the remaining 30% as top companies (ibid).

The results of hypothesis testing

Hypothesis: the average return in companies with low product variety and diversity is highly significant.

To test this hypothesis, two populations were compared.

H 0: There is no significant difference between the average yield in companies with low product variety and diversity.

H1: There is significant difference between the average return in companies with low product variety and diversity.

The results of this test are shown in Table 1.

Table 1. Results of independent samples t-test

Confidence level of 95%							During the test for equality of variances		
Upper bound Upper bound	Lower bound	Sample standard deviation	Difference in mean	Sig (2-tailed)	df	t	Sig	F	
0/13812	0/01121	0/03735	0/06345	0/094	62	1/699	0/611	0/262	Equality of two population variances
0/13458	0/00767	0/03526	0/06345	0/079	42/526	1/800			Inequalities between population variance

Table 1 indicates independent samples t-test. In column Sig (2-tailed), the level of significance for both is greater ($\frac{\propto}{2} = 0.025$) and the null hypothesis for each case (equality and inequality of the variance) is confirmed and it is concluded that there were no significant differences between the average return in companies with low product variety and diversity and the hypothesis is rejected.

In column F, the statistic is calculated Leuven. The quantity is used for hypothesis testing $H_o: \propto_1^2 = \propto_2^2$ against $H_o: \propto_1^2 \neq \propto_2^2$ while we do not have any information on the distribution of the population. In column Sig, the significance of level was 0.611. Therefore, the null hypothesis that the two population variances are equal will be confirmed during the test.

Sub-Hypothesis 2: diversification increases the validity of the model and it can explain the changes in efficiency.

In this study, seven regression equations were formulated:

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{b_i} \times MKT + \varepsilon_t \quad (1)$$

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{s_i} \times SMB + \varepsilon_t \quad (2)$$

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{h_i} \times HML + \varepsilon_t \quad (3)$$

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + b_i \times MKT + \mathrm{s_i} \times SMB + \varepsilon_t \quad (4)$$

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + b_i \times MKT + h_i \times HML + \varepsilon_t \quad (5)$$

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{s_i} \times SMB + h_i \times HML + \varepsilon_t \quad (6)$$

$$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + b_i \times MKT + \mathrm{s_i} \times SMB + h_i \times HML + \varepsilon_t \quad (7)$$

The formula a_i is average abnormal return of stock and i is the theory of capital asset pricing model which is equal to zero. $h_i, s_i, b_i$are respectively the market factors, variety and value portfolios.

ε_t Specific return on portfolio i with mean zero (Davis, Fama & French, 2000).

The following Table describes the parameters for each of the above regression equations, and the Sig and R^2 are given for each equation.

Table 2- Summary of the models and parameters

equation	a_i	b_i	s_i	h_i	Sig	R^2
1	-0/078	0/074	---	---	0/912	0/008
2	-0/072	---	0/246	---	0/810	0/036
3	-0/091	---	---	-0/228	0/687	0/098
4	-0/859	2/485	3/874	---	0/413	0/830
5	-0/466	1/075	---	-1/015	0/672	0/548
6	-0/142	---	-1/897	-1/255	0/861	0/259
7	-1/251	4/049	9/316	1/849	0	1

The market risk premium was tested by using the regression equation (Equation 1).

$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{b_i} \times MKT + \varepsilon_t$

As a result, the following equation was obtained:

$\mathrm{R_i} - \mathrm{R_f} = -0.078 + 0.074 \times MKT$

As shown in Table 2 R^2 (coefficient of determination) is 0.008 which is very low. Sig value in the ANOVA table is 0.912. So, by considering "not significant regression" null hypothesis with reliability more than 0.088 is rejected. Then it was added to the variety of operating under the regression equation (Equation 4):

$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + b_i \times MKT + \mathrm{s_i} \times SMB + \varepsilon_t$

As a result, the following equation was obtained:

$\mathrm{R_i} - \mathrm{R_f} = -0.859 + 2.485 \times MKT + 3.874 \times SMB$

R^2 (Coefficient of determination) this equation is 0.830. Sig value in the ANOVA table is 0.413. Thus, the null hypothesis of "no significant regression" is not confirmed with a reliability more than 0.587.As it is clear by adding a product to the equation of variation R^2 (coefficient of determination) the reliability level has increased significantly.Now the regression equation (3) is used to test the relationship of book value and market value of portfolio risk premium:

$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{h_i} \times HML + \varepsilon_t$

As a result, the following equation was obtained:

$\mathrm{R_i} - \mathrm{R_f} = -0.091 + 0.228 \times HML$

As shown in the table, R^2 (coefficient of determination) that is 0.098 is very low. Sig value in the ANOVA table is 0.687. So, the null hypothesis of "no significant regression" is rejected with reliability more than 0.313. Then, by using equation 6, the relationship between the ratios of book value to market value of the portfolio risk premium product diversity was measured.

$\mathrm{R_i} - \mathrm{R_f} = \mathrm{a_i} + \mathrm{s_i} \times SMB + h_i \times HML + \varepsilon_t$

As a result, the following equation was obtained:

$\mathrm{R_i} - \mathrm{R_f} = -0.142 - 1.897 \times SMB - 1.255 \times HML$

R^2 (Coefficient of determination) in the above equation is 0.259. Sig value in the ANOVA table is 0.861. So, the null hypothesis of "no significant regression" is rejected with reliability more than 0.139. By comparing this equation with Eq 3 we found low level of reliability in both

equations but R^2 (coefficient of determination) in equation (6) is increased. By using equation (5) the relationship between the ratio of book value to market value and the risk premium risk premium portfolio was measured.

$$R_i - R_f = a_i + b_i \times MKT + h_i \times HML + \varepsilon_t$$

As a result, the following equation was obtained:

$$R_i - R_f = -0.466 + 1.075 \times MKT - 1.015 \times HML$$

As shown in Table 2 R^2 (coefficient of determination) is equal to 0.548. Sig value in the ANOVA table is 0.672. So, the null hypothesis of "no significant regression" is rejected with reliability more than 0.328. The level of R^2 (coefficient of determination) and the level of reliability in the equation is 3 and 1, respectively. The relationship between the ratio of book value to market value of the portfolio risk premium and the relationship between risk premium as measured by portfolio risk premium is higher, so the model is higher than 5.

Finally, the regression equation 7, the relationship between the three factors was tested with portfolio risk premium.

$$R_i - R_f = a_i + b_i \times MKT + s_i \times SMB + h_i \times HML + \varepsilon_t$$

As a result, the following equation was obtained:

$$R_i - R_f = -1.251 + 4.049 \times MKT + 9.316 \times SMB + 1.849 \times HML$$

R^2 (Coefficient of determination) in the above equation is 1. Sig value in the ANOVA table is 0.000. So, the null hypothesis of "no significant regression" is rejected with reliability more than 0.999. Therefore, the hypothesis that "diversification increases the efficiency of the model and can explain changes" may be approved.

Table 3. Summary of the models and parameters

equation	a_i	b_i	s_i	h_i	Sig	R^2
1	-0/078	0/074	---	---	0/912	0/008
2	-0/072	---	0/246	---	0/810	0/036
3	-0/091	---	---	-0/228	0/687	0/098
4	-0/859	2/485	3/874	---	0/413	0/830
5	-0/466	1/075	---	-1/15	0/672	0/548
6	-0/142	---	-1/897	-1/255	0/861	0/259
7	-1/251	4/049	9/316	1/849	0	1

As mentioned above, in this study we have seven regression equations and the following table describes the parameters for each of the regression equations and $R^2$and Sig are presented for each equation.

When we examine the regression equations in Table 3, we know that with the exception of one case, in other cases (coefficients SMB) is positive and this causes the coefficient has positive and significant impact on the performance of companies. Thus, the main hypothesis is confirmed.

Conclusion

Since the objective of this study was to investigate the impact of diversification of products on companies' productivity in Tehran Stock, hence to achieve this objective, the main hypothesis and sub-hypothesis has been proposed.

The results of hypotheses testing suggest that:

By using a statistical comparison of the two communities, the average return in companies with low product variety and diversity is highly significant. The variances between the two communities are the same. As a result, the first sub-hypothesis is rejected.

Equations using the Fama and French model indicated that when the product range was added to the equation, R^2 (Coefficient of determination) and also reliability of equation was increased. Thus, the hypothesis that "diversification increases the efficiency of the model and can explain changes" is approved. As a result, the second sub-hypothesis is confirmed.

When we consider the regression equation, it can be found that with the exception of one case, in other cases coefficients SMB is positive, and has positive and significant impact on the performance of companies. So, the main hypothesis is confirmed.

Limitations of the study

In relation to the research process, there are some limitations and shortcomings.

- Study period (2007-2011) is heterogeneous because the stock fluctuated over the years, but in this study it was assumed that the research is homogeneous. On the other hand, some calculations of the change in the exchange which were achieved in 2011 were more homogeneous data and were removed during the period of the study.

- Market efficiency because of the high and low price fluctuations will not be affected and will yield the correct diagnosis.

Suggestions for future research

During the process of completing the study, the following researches seem to be useful:

Fama and French model can be directly used in portfolio management, investment performance evaluation, determining the expected returns and the cost of capital. So, testing the potential presence of other variables in the model can be considered as further research to students.

Fama and French three-factor model has been tested alone. For a more comprehensive research other research model can be used along with it and the results are compared with each other for more information and to select the optimal portfolio of investments held by investors.

References

Davis, J.L., Eugene, F., & Fama and Kenneth R. (2000). Characteristics, Co Variances, & Average Returns : 1929 to 1997, Journal of Finance , 55, 392.

Eshragh Nia Jahromy, A.H., &, Kamyar, H. (2008). Fama and French three-factor model tested in the Tehran Stock Exchange, Journal of Sharif, 45.

Fama , Eugene F., & Kenneth R. F. (19930 Common risk factor in the returns on stocks and bonds, Journal of Finance, 33, 3-56.

Islami, Bidgoli, G., & Khojasteh, M.A. (2009). Fama and French three-factor model to improve the explanation of the expected return on the capital productivity, Jsabdary Research.

Mojtahed Zadeh, V., &Taromi, M. (2006). Fama and French three-factor model test in Tehran Stock Exchange for predicting stock returns, Message Management, 17 ,18, 109 -132.

Tehrani, R., & Ahmadian Vahed, H. (2006). The relationship between the risk and return of a stock company manufacturing a variety of products with the Tehran Stock Exchange, Journal of Commerce, 38.