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Research Paper

Developing of Eight Factor Model for Measuring Stock Returns Through Market Stress, the Rate of Market Fragility and Market Liquidity Risk Variables[1]

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This research is based on an eight-factor model consisting of the Fama and French five-factor model plus the variables of market stress, market fragility, and market liquidity risk in order to investigate the explanatory power of this model in the Tehran securities market during the years 2009 to 2018 for 117 companies on a monthly basis. The results of the research indicated that the explanatory capability of the eight-factor model is better than the Fama and French five-factor model in the Iranian capital market. The results also show that fragility and stress have a significant negative relationship with stock returns and liquidity risk has a significant positive relationship with stock returns. This result can be of interest to policymakers in the field of finance and investment and other stakeholders.

Introduction:

One of the most important indicators considered by investors in choosing to invest in the stock market is the financial criterion of stock returns. Since most investors are

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risk-averse, they are willing to invest in securities only when they can get an optimal return in proportion to the risk they bear. Also, due to the growth and development of financial markets and tools, the complexity of financial markets, and the specialization of the investment category, investors and financial market workers need tools, methods, and models that help them choose the best investment and the most suitable portfolio. In this direction and to help investors and other users, this research has developed Fama and French's five-factor model, taking into account the risk factors of liquidity, stress, and market fragility.

One of the factors affecting stock returns is liquidity risk. The role of the liquidity factor is important in the valuation of assets and is caused by the crystallization of the concept of the risk of non-liquidity of assets in the buyer's mind. An accepted belief in financial economics is that the liquidity of a financial asset changes over time. The role of liquidity was first investigated in asset pricing by Amihud and Mendelson in 1986 and can be measured by several criteria. Among them is the market liquidity risk measure of Pasteur and Stamba in 2003, who claimed that adding it to the three-factor model will absorb the effect of past returns (Oramo and Korida, 2009).

So far, many models have been proposed by researchers to explain and predict stock returns, which are known as stock pricing models (such as the research of Sharp (1964); Lintner (1965); Black (1972); Basu and Ross (1977); Benz (1981). ; Jigadish (1993); Bhandari (1988 and 1978); Kim (1990); Fama and French (1992); Pasteur and Stamba (2003) and Fama and French (2013)).

Studies on the relationship between return and risk go back to the Capital Asset Pricing Model (CAPM) by Sharpe in 1964, in which it is assumed that the return of each portfolio is only caused by systematic risk, and it became known as the single-factor model. Various irregularities such as company size, profit-to-price ratio, financial leverage, book-to-market ratio, long-term returns, and momentum in the single-factor model and the challenges that this model faced, multi-factor models were proposed as more complete financial models. (Salehi, 2015). After that, the research of Fama and French in the years (1993, 1996, 1997, 2006, 2008, 2010, and 2012) have caused a transformation in the field of studying multi-factor models. The first study by Fama and French in 1993 has a special place among the studies related to the explanation of stock returns, which has become famous for the three-factor model. Considering three variables, beta, company size, and the ratio of book value to market value, they have tried to explain the relationship between companies' stock returns. The results of their research showed that the explanatory power of their model is better than the Capital Asset Pricing Model (CAPM) (Fama and French, 1993). In 1997, Carhart proposed a four-factor model by adding the momentum factor to the three-factor model of Fama and French. In fact, this factor indicated that the attitude of the market remains retrospective until it finally changes direction (Artman et al., 2012). Carhart's research and its model became the source of the formation of many studies such as Campbell et al. (2008), Sehgal and Jain

(2011), and Artman et al. (2011) in the field of yield prediction. Finally, Carhart believes that his four-factor model significantly reduces the pricing error, Capital Asset Pricing Model (CAPM), and Fama and French's three-factor model (Carhart, 1997).

Hopnit and Johnson in 2011, another four-factor model including factors; designed to market, investment, profitability, and liquidity, which is obtained by adding the liquidity factor to the three-factor model of Chen et al. In comparison with Carhart's four-factor model, they believe that when the momentum factor was added to Fama and French's three-factor model, it significantly improved the performance of the model. Instead, the effect of adding the liquidity factor as the fourth factor to the three-factor model of Fama and French was meaningless and close to zero (Happnit and Johnson, 2011).

In 2014, Hu and colleagues presented a four-factor model including explanatory variables of beta, company size, profitability, and investment. In this model, the profitability factor (ROA) is the difference between the average return of a set of stocks with high profitability and a set of stocks with low profitability.

In 2013, Fama and Fringe developed their three-factor model and added two new factors, the profitability and investment of the company to the three factors; Market, size, and (B/M) tried to increase the explanatory power of their model for stock returns and thus designed a new five-factor model.

In 2017, Daoui and Bensala presented their six-factor model by adding the investor sentiment index. This six-factor model indicated that the power of explaining the returns of this model is clearly better than the Fama and French five-factor model by including the investor sentiment index. and Bensela, 2017).

The results of this research show that the introduced factors alone are not able to explain stock returns. According to the arbitrage theory, different factors should be considered to explain stock returns, but these factors have not been determined.

In this regard, the researchers in this article are looking for this, considering the existence of shocks caused by changes in economic variables such as exchange rate fluctuations, changes in economic and tax laws, and political variables such as oppressive sanctions, which harm the country's industry and economy. and also, the different cultural and social conditions that exist in our country, to state what variables and factors can be put together in a model so that compared to other conventional models, it can better explain the returns of companies' stocks and explain, Therefore, because none of the previous researches in Iran have studied the role of market stress, the speed of market fragility and the risk of market liquidity, in this article, in line with the evolution of the aforementioned models, an attempt has been made to present a new model, so that the role of variables Explain and present the aforementioned, in the form of which investors can be helped in predicting stock returns.

Research hypotheses:

According to the theoretical foundations and background of the studies and according to the purpose of the research, the hypotheses of the research are presented as follows:

The main hypothesis: the eight-factor model can better explain the stock returns of companies than the five-factor model.

The first sub-hypothesis: There is a significant relationship between the market stress variable and the stock returns of companies.

The second sub-hypothesis: there is a significant relationship between the market fragility speed variable and the stock returns of companies.

The third sub-hypothesis: there is a significant relationship between the liquidity risk variable and the stock returns of companies

The research model and its variables:

To test the hypotheses in this research, three multivariate regression equations are developed as described in models 1 to 7:

Model (1):

$$R_i - R_f = \alpha_0 + \beta_1\left(R_m - R_f\right) + \beta_2 SMB_{it} + \beta_3 HML_{it} + \varepsilon_{it}$$

Model (2):

$$R_i - R_f = \alpha_0 + \beta_1\left(R_m - R_f\right) + \beta_2 SMB_{it} + \beta_3 HML_{it} + \beta_4 RMW_{it} + \beta_5 CMA_{it} + \varepsilon_{it}$$

Model (3):

$$R_i - R_f = \alpha_0 + \beta_1\left(R_m - R_f\right) + \beta_2 SMB_{it} + \beta_3 HML_{it} + \beta_4 RMW_{it} + \beta_5 CMA_{it} + \beta_6 RREV_{it} + \beta_7 Stress_{it} + \beta_8 fragility_{it} + \varepsilon_{it}$$

Model (4):

$$Stress = \Delta\sigma_{mkt,t-1}$$

Model (5):

$\text{Fragility}_{i,t} = FI \rightarrow$ Fragility Index

Model (6):

r_(i,d+1,t)^e=θ_(i,t)+∅_(i,t)+r_(i,d,t)+ 〖RREV〗_(i,t)×Sign (r_(i,d+1,t)^e) ×r_(i,d,t)+ε_(i,d+1,t)

Model (7):

$$RREV_t = \left(\frac{mt}{m1}\right).\left(\frac{1}{N_t}\right)\sum_{t-1}^{N_t} RREV_{i,t}$$

Research methodology

This research is applied in terms of purpose and correlational in nature. This research has a deductive-inductive approach and among the types of correlation research, it is part of regression analysis. Also, considering that the data used in the current research is real and historical information and it can be classified as post-event type. The statistical population of this research is all companies admitted to the Tehran Stock Exchange from 2018 to the end of 2017. The systematic elimination method has been used to determine the statistical sample considering the following conditions.

1. Companies that have been in the stock market from 1388 to 1397.
2. Companies whose financial year ends on 12/29.

3. Companies that have not changed in the financial year.
4. Companies that have not had a significant trading break (more than 6 months).
5. The member companies of the holding group were not financial intermediaries, insurance and banks.

For this purpose, 117 companies have been selected to estimate the models and test the research hypotheses. Also, to formulate the theoretical foundations of the research from the library method and to collect the desired data from the information provided on the central bank information site, financial statements provided to the stock exchange organization and other related information sources such as; Tadbir Pardaz and Rahvard Novin Se database has been used.

Conclusion

After the financial crises in the last decade, many studies proposed measurement criteria that can predict the phenomena of collapse or development. In the eight-factor model presented in this research, stock returns are explained based on Fama and French's five-factor model, plus market stress variables, market fragility speed, and liquidity risk. According to the findings of the research in which, for the eight-factor model, the coefficient of determination (R^2) was calculated as 0.528 and the F-statistic of the test was 1968/698, which is larger and stronger than the five-factor model with the coefficient of determination (R^2) It is equal to 0.471 and the F-statistic of the test is 102.802. Therefore, it can be said that the eight-factor model can better explain the stock returns of companies admitted to the Iranian capital market than the five-factor model, and the main hypothesis is confirmed.

Keywords: Liquidity Risk, Fragility, Market Stress, Fama and French Five-Factor Model, Stock Return
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