Int. J. Nonlinear Anal. Appl.
Volume 11, Special Issue, Winter and Spring 2020, No. 2, 21-30
ISSN: 2008-6822 (electronic)
http://dx.doi.org/10.22075/ijnaa.2020.44439

# Presenting a Model for Portfolio Risk Premium Assessment: Evidence from the Tehran Stock Exchange

Hamid Reza Azizi[a], Asgar Pakmaram[b*], Nader Rezaei[c], Rasoul Abdi[d]

[a] *Ph.D. Candidate in Accounting, Bonab Branch, Islamic Azad University, Bonab, Iran.*
[b,c,d] *Associate Prof. of Accounting, Bonab Branch, Islamic Azad University, Bonab, Iran.*

**Abstract**

This study aimed to present a model for portfolio risk premium assessment of companies listed in Tehran Stock Exchange. In order to achieve this purpose, monthly data of 150 companies listed in Tehran Stock Exchange during 2007-2017 was used. In this study, the predictive powers of Fama-French three-factor model [11], Carhart four-factor model [1], Fama - French five-factor model [24], Brousseau five-factor model [18] and Roy and Shijin six-factor model [44] have been evaluated using variables used in the mentioned models and then an optimal model has been developed for portfolio risk assessment using stepwise regression. Findings showed that the Carhart four-factor model has higher predictive ability (48.3%) than other mentioned models in the Tehran Stock Exchange. According to the results of stepwise regression, seven variables have been selected as effective variables on portfolio risk premium. The explanatory power and predictive ability of the model developed in the Tehran Stock Exchange was 55.7% indicating higher predictive ability respect to previous models on portfolio risk premium. Investigation of the coefficients of the developed model showed that market risk premium, size factor, value factor, momentum factor and accounting quality factor have positive and significant effects on portfolio risk premium while investment factor and liquidity risk factor have significant negative impacts on portfolio risk premium.

*Keywords:* Portfolio Risk Premium, Fama-French Three-Factor Model, Fama-French Five-Factor Model, Carhart Four-Factor Model, Brousseau Five-Factor Model, Roy and Shijin Six-Factor Model.
*2010 MSC:* 76T20

*Corresponding Author: Asgar Pakmaram
*Email address:* Gh_azizi60@yahoo.com, Pakmaram@bonabiau.ac.ir, Naderrezaeimiyandoab@gmail.com, Abdi_rasool@yahoo.com (Hamid Reza Azizi[a], Asgar Pakmaram[b*], Nader Rezaei[c], Rasoul Abdi[d])

*Received:* January 2020 *Revised:* May 2020

## 1. Introduction

Standard pricing models are prospective and they use assumptions about investors' tastes and portfolio opportunities to predict how risk should be measured aa well as to study the relationship between risk and expected return. In contrast, empirical models are also retrospective. In empirical models, investors' tastes and portfolio opportunities are included as patterns in average returns and proposed models take them into account.

Since no study has been conducted in Iran to provide a new model for assessment of portfolio risk premium during 2009-2015, this study has tried to present a model for assessing portfolio risk premium compatible with the Iranian reporting environment in Iran following researches of Fama and French [24], Brousseau [18] and Roy and Shijin [44]. Therefore, identifying a suitable model extracted from the results of current study can be very effective in the economic decisions made by various investors including actual and potential shareholders of companies to assess the accuracy of profit management predictions. Reviewing literature and background of research in Iran makes it clear that no research has been done on the of Fama - French five-factor model despite high importance of factor models and their applications in financial issues and their various abnormalities. In this study, the efficiency of the five-factor model of pricing capital assets has been fully investigated in the Tehran Stock Exchange.

## 2. Theoretical Background and Literature Review

Investors feel that their capital is at risk when they are trading their assets in one or more types of securities expected to get return in the future so they consider another factor in addition to return called risk. Hence, in order to make a successful investment, it is necessary to pay attention to both risk and return factors at the same time. This complexity and sensitivity has emerged a variety of theories to quantify the relationship between stock price and the variables affecting them such as return and risk. In recent decades, one of the most important advances in financial theory is to discuss about risk in a measurable way. If it is clear how to accurately measure the financial risks of fair pricing, it will be properly possible to assess risky assets. This will increase the efficiency and optimal allocation of resources in the financial system. In other words, investors will be able to allocate their savings for risky stocks.

After about 20 years, it became clear that the three-factor model is unable to explain cross-sectional changes in average stock return. There is also evidence that profitability and investment are related to average stock return. Recently, Novy and Marx [43] showed that the three-factor model could not explain the average return concerned with profitability. Aharoni, Grundy and Zeng also proved a significant but poor relationship between investment and average stock return [15]. Fama and French used a discounted cash flow model considering specific assumptions to explain why these variables are associated with average returns [25]. Based on empirical evidence, Fama and French added profitability and investment factors to their three-factor model.

### The research purpose

The purpose of this study was to provide a model for assessing portfolio risk premium in the Tehran Stock Exchange.

## 3. Research methodology

### *3.1. Methods for collecting information and data*

This research is applied in terms of purpose. Its plan is a quasi-experimental and ex-post facto research and it is done using historical information. Journals, books, as well as available databases have been used to collect information on the theoretical background of research. Also, the data needed for the analysis was extracted from the Rahnavardnovin software, the information of audited financial statements and the explanatory notes of the companies.

### *3.2. Statistical population, statistical sample and research temporal domain*

According to spatial scope of the research, the statistical population includes all the companies accepted in the Tehran Stock Exchange whose stocks have been traded in the first market from 2007 to 2017. Selectin of companies included in the statistical population should be done considering spatial and temporal scope of the research based on the following criteria:

1. They have been accepted in Tehran Stock Exchange at least since March 3, 2007.
2. The sample companies are not investment and financial companies (banks);
3. Sample companies have not been suspended during 2007 to 2017 to get conventional stock price.
4. Ending of their financial year is March 19.
5. Financial year of sample companies has not been changed during 2007 to 2017.
6. The information required to do the research should be reported to the stock exchange organization by the end of the fiscal year 2017 and it should be available.

According to the above conditions and restrictions, 150 companies have been selected as the statistical sample among all companies listed in the Tehran Stock Exchange.

## 4. Research models

### *4.1. Fama-French Three-Factor Model*

Fama and French have tried to justify the unusual reported observations using their three-factor model [29]. They believed that if three-factor model is used instead of the Sharpe capital asset pricing model, many observations that are not explained with Sharpe model can be justified. The model provided by Fama and French is as follows:

$$R_i - R_f = b_i(R_m - R_f) + s_i(SML) + h_i(HML) + \epsilon \tag{4.1}$$

where: $R_m - R_f$ is market portfolio excess return relative to risk-free return rate. SML (Small Mines Large) is the difference between portfolio return of small size companies and the portfolio return of large size companies. HML (High Mined Low) is the difference between the portfolio return of stock with a large book value/market value ratio and the portfolio return of stock with a small book value/market value ratio. $b_i$, $s_i$ and $h_i$ are also return sensitivity respect to these factors.

*4.2. Carhart Four-Factor Model*

In their four-factor model, has added tendency for past performance factor to Fama-French three-factor model [1]. The performance is evaluated based on the difference between the average portfolio returns of winning companies (companies with a tendency for high past performance) and average portfolio returns of losing companies (companies with a tendency for low past performance). In the Carhart model, the pattern used to test the research hypotheses is as follows: SMB, HML and WML variables represent size factor, value factor and momentum factor, respectively [1]

$$R_i - R_f = b_i(R_m - R_f) + s_i(SML) + h_i(HML) + r_i(WML) + \epsilon \tag{4.2}$$

*4.3. Fama - French Five-Factor Model*

In The Fama - French five-factor model [24], SMB, HML, RMW and CMA variables represent size factor, value factor, profitability factor and investment pattern factor, respectively:

$$R_i - R_f = b_i(R_m - R_f) + s_i(SML) + h_i(HML) + r_i(RMW) + c_i(CMA) + \epsilon \tag{4.3}$$

where:
**Portfolio (stock) excess return** $(R_i - R_f)$ is the additional return above and beyond the risk-free return obtained by an investor after buying the stock due to price changes or profit division during the retention period and known as portfolio (stock) risk premium.
**Market excess return** $(R_m - R_f)$ is the additional return above and beyond the risk-free return obtained by an investor due to buying a market portfolio during the retention period and is known as market risk premium.
**SMB factor** indicates the difference between the average portfolio return of small size companies and the average portfolio return of large size companies.
**HML factor** indicates the difference between the average portfolio return of companies with a small B/M ratio and the average portfolio return of companies with a large B/M ratio.
**RMW factor** indicates the difference between the average portfolio return of companies with strong profitability and the average portfolio return of companies with low profitability.
**CMA factor** indicates the difference between the average portfolio return of companies with low investment volume and the average portfolio return of companies with high investment volume.

*4.4. Brousseau Five-Factor Model*

In Brousseau five-factor model, SMB, HML, MKT, LIQ and AQF variables represent size factor, value factor, profitability factor, liquidity risk factor and the accounting quality factor, respectively [18]:

$$R_i - R_f = b_i(R_m - R_f) + s_i(SML) + h_i(HML) + r_i(LIQ) + c_i(AQF) + \epsilon \tag{4.4}$$

*4.5. Liquidity Risk Factor (LIQ)*

A stock with high Amihud non-liquidity ratio experiences a large price change for a small trading volume. This ratio is obtained through dividing the absolute return by the trading volume during a certain period. This measure is calculated as an annually average value. If the amount of non-liquidity ratio is high, that stock has non-liquidity problem. It means that the stock price changes considerably against small trading volumes. This criterion is interpreted as the reaction of the daily stock price to the trading volume.

*4.6. Accrual quality*

The accrual quality is calculated based on the MacNichols (2002) model. The MacNichols model is as follows:

$$\frac{\triangle WC_{i,t}}{Assets_{i,t}} = \beta_{0,i} + \beta_{1,i}\frac{CFO_{i,t-1}}{Assets_{i,t}} + \beta_{2,i}\frac{CFO_{i,t}}{Assets_{i,t}} + \beta_{3,i}\frac{CFO_{i,t+1}}{Assets_{i,t}} + \beta_{4,i}\frac{\triangle sales_{i,t}}{Assets_{i,t}} + \beta_{5,i}\frac{PPE_{i,t}}{Assets_{i,t}} + V_{i,t} \quad (4.5)$$

where $\triangle WC_{i,t}$ is the change in the working capital accounts of company $i$ in year t calculated as follows:
Change in working capital accounts = increase in accounts receivable + increase in inventory + decrease in accounts payable and debts + decrease in taxes payable + increase (decrease) in other assets (debts)

- $Assets_{i,t}$: The average assets of company i in the year t
- $CFO_{i,t-1}$: Cash received due to operations of company i in the year t-1
- $CFO_{i,t}$: Cash received due to operations of company i in the year t
- $CFO_{i,t+1}$: Cash received due to operations of company i in the year t+1
- $\triangle sales_{i,t}$: Changes in the sales account of company i in the year t
- $PPE_{i,t}$: Machinery and equipment property of the company i in the year t
- $V_{i,t}$: Residual error

The value of the residual error in Equation (4.5) indicates that the estimation error in the current accruals is not related to the operating cash flow and it cannot be explained by changes in revenue and machinery and equipment. In present study, the absolute value of residual error is used as a representative for the quality of financial reporting.

*4.7. Roy and Shijin Six-Factor Model*

In Roy and Shijin six-factor model [44], LBR, Rm-Rf, SMB, HML, RMW and CMA variables indicate income growth factor, market risk premium factor, size factor, value factor, profitability factor and investment factor, respectively:

$$R_i - R_f = b_i(R_m - R_f) + s_i(SML) + h_i(HML) + r_i(RMW) + c_i(CMA) + l_i(LBR) + \epsilon \quad (4.6)$$

## 5. Research findings

*5.1. Descriptive Statistics*

Tables 1 presents some concepts of descriptive statistics for variables including mean, median, minimum observations, maximum observations and standard deviations. The results show that the mean portfolio risk premium is 0.0048 for the studied companies that indicate. High standard deviation (0.1053) implies high volatility of portfolio risk premium. The mean (0.058), minimum (-.0745) and maximum (0.1201) values of market risk premium variable with standard deviation of 0.557 show a high volatility of this variable.

Table 1: Descriptive statistics for variables used in the model

| The name of Variable | Symbol of Variable | Number of observations | Mean | Median | Maximum | Minimum | SD |
|---|---|---|---|---|---|---|---|
| Portfolio Risk Premium | $R_i - R_f$ | 19800 | 0.0048 | -0.0141 | 0.2693 | -0.1644 | 0.1053 |
| Market Risk Premium | $R_m - R_f$ | 19800 | 0.0058 | -0.0004 | 0.1201 | -0.0745 | 0.0557 |
| Size Factor | SMB | 19800 | 0.0031 | 0.0033 | 0.0555 | -0.0486 | 0.0275 |
| Value Factor | HML | 19800 | -0.0229 | -0.0207 | 0.0349 | -0.0928 | 0.0343 |
| Momentum Factor | WML | 19800 | 0.0366 | 0.0339 | 0.1363 | -0.0336 | 0.0415 |
| Investment Factor | CMA | 19800 | -0.0229 | -0.0234 | 0.0365 | -0.0863 | 0.0326 |
| Profitability Factor | RMW | 19800 | -0.0229 | -0.0203 | 0.0515 | -0.0926 | 0.0356 |
| Liquidity Risk Factor | LIQ | 19800 | 0.0085 | 0.0099 | 0.0665 | -0.0527 | 0.0306 |
| Accounting Quality Factor | AQF | 19800 | 0.0118 | 0.0084 | 0.0592 | -0.0246 | 0.0223 |
| Monthly Income Growth Factor | LBR | 19800 | -0.00044 | -0.0046 | 0.0334 | -0.0603 | 0.0244 |

Table 2: Results of F Limer Test

| Model | Test Statistics | Probability | Result |
|---|---|---|---|
| 1 | 0.6928 | 0.9983 | Combined method |
| 2 | 0.6994 | 0.9979 | Combined method |
| 3 | 0.6930 | 0.9983 | Combined method |
| 4 | 0.7092 | 0.9971 | Combined method |
| 5 | 0.6929 | 0.9983 | Combined method |

## 6. Reliability of research variables

According to Table 3 and based on the tests listed in the tables, all independent, dependent and control variables are reliable during research since probabilities of all variables are less than 5%. As can be seen, all variables are reliable and co-integration test is not required. Therefore, there is not pseudo regression problem in estimation coefficients. In the significant pseudo regression, the coefficients are pseudo.

Table 3: Reliability results of research variables

| Variable | Symbol of Variable | Levin-Lin-Chu test | | Im, Pesaran, and Shin test | | Fisher-ADF test | | Fisher-PP test | | Result |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Test statistics | Probab-ility | Test statistics | Probab-ility | Test statistics | Probab-ility | Test statistics | Probab-ility | |
| Portfolio Risk Premium | $R_i - R_f$ | -135.56 | 0.000 | -122.79 | 0.000 | 9811.3 | 0.000 | 9964.7 | 0.000 | Reliable |
| Market Risk Premium | $R_m - R_f$ | -98.99 | 0.000 | -85.24 | 0.000 | 6344.6 | 0.000 | 6192.2 | 0.000 | Reliable |
| Size Factor | SMB | -140.45 | 0.000 | -115.78 | 0.000 | 9259.4 | 0.000 | 9078.5 | 0.000 | Reliable |
| Value Factor | HML | -137.23 | 0.000 | -129.56 | 0.000 | 10439.9 | 0.000 | 10490.1 | 0.000 | Reliable |
| Moment-um Factor | WML | -110.74 | 0.000 | -90.28 | 0.000 | 6839.1 | 0.000 | 6109.1 | 0.000 | Reliable |
| Investm-ent Factor | CMA | -144.10 | 0.000 | -124.25 | 0.000 | 9999.5 | 0.000 | 9946.5 | 0.000 | Reliable |
| Profitab-ility Factor | RMW | -138.07 | 0.000 | -122.64 | 0.000 | 9862.1 | 0.000 | 9862.1 | 0.000 | Reliable |
| Liquidity Risk Factor | LIQ | -134.88 | 0.000 | -118.93 | 0.000 | 9539.6 | 0.000 | 9544.8 | 0.000 | Reliable |
| Account-ing Quality Factor | AQF | -99.88 | 0.000 | -88.19 | 0.000 | 6526.6 | 0.000 | 6763.2 | 0.000 | Reliable |
| Monthly Income Growth Factor | LBR | -117.17 | 0.000 | -108.18 | 0.000 | 8561.8 | 0.000 | 8768.1 | 0.000 | Reliable |

## 7. Results of estimating models of the research

Table 4: Results of estimating second model of the research (Carhart four-factor model [1])

| $R_i - R_f = b_i(R_m - R_f) + s_i(SML) + h_i(HML) + r_i(WML) + \epsilon$ | | | | | |
|---|---|---|---|---|---|
| Variable | Symbol of Variable | Estimated Coefficient | Standard Error | t-Statistic | Probability |
| Constant Value | C | 0.006155 | 0.001327 | 4.638172 | 0.0000 |
| Market Risk Premium | $R_m - R_f$ | 0.491908 | 0.005263 | 93.46353 | 0.0000 |
| Size Factor | SMB | 0.143570 | 0.015778 | 9.099123 | 0.0000 |
| Value Factor | HML | 0.322715 | 0.009231 | 34.95888 | 0.0000 |
| Momentum Factor | WML | 0.259999 | 0.007060 | 36.82691 | 0.0000 |
| Adjusted Coefficient of Determination | | | | | 0.483 |
| Durbin-Watson | | | | | 1.999 |
| F-Statistic | | | | | 4633.38 |
| Probability (F-Statistic) | | | | | 0.0000 |

According to Table 4, the results of Carhart four-factor model estimation show that the F-probability value (or significance level) is 0.0000. because this value is less than 0.05, the null hypothesis is rejected with 0.95 confidence interval indicating the model is significant [1]. The Durbin -Watson statistic is 1.999 which indicates that the errors are not auto-correlated. The results of the adjusted coefficient of determination show that approximately 48.3% of the variability in portfolio risk premium are explained by four factors including market risk premium factor, size factor, value factor and momentum factor. In other words, the explanatory power and predictive ability of the four-factor Carhart model [1] in the Tehran Stock Exchange is 48.3%. Careful study of the coefficients shows that according to the Carhart four-factor model [1], all four factors are significant in the model at 95% confidence level. In other words, at the 95% confidence level in the Iranian Stock Exchange, all four market risk premium, size, value and momentum factors have positive and significant effects on portfolio risk premium at 95% confidence level.

## References

[1] N. Izadiania, M. Ebrahimi, and A. Hajiannejad, Comparison of Fama-French Main Three-Factor Model with Carhart Main Four-Factor Model in Explaining the Stock Return of Companies Listed in the Tehran Stock Exchange, Asset Management and Financing, 2nd year, 3 (2014): 17-28.
[2] A. Talangi, Confrontation of modern Financial Theory and Behavioral Finance, Financial Research, 2 (2004): 27
[3] R. Rai, and A. Talangi, Advanced Investment Management, Samat Press, Tehran, 2004.
[4] R. Rai, and S. Fallahpour, Behavioral Finance as a Different Approach in the Financial Field, Financial Research, No. 18 2004.
[5] H.A. Sinaei, Evaluating Efficiency in Tehran Stock Exchange, Financial Research, No. 2, 1992.
[6] M. Sadeghi, Investigation on Efficiency of Momentum and Contrarian Strategies in Tehran Stock Exchange, Management Knowledge, 29 (2007): 27.
[7] H. Abde Tabrizi, and M. Gonabadi, Doubts about the Validity of Financial Models, Accountant Magazine, No. 115 (1996).
[8] T. Ghaemi, A Study on Factors Affecting the Common Stocks Return of Companies Listed in Tehran Stock Exchange, Quarterly Journal of Management Perspectives, No. 17 (2006).
[9] M.H. Ghaemi and A. Zarifard, Experimental Test of Capital Asset Pricing Model in Tehran Stock Exchange, No. 13 (2003): 41-53.

[10] G.R. Kurdistani, M. Ghasemi, Evaluating Performance of Risk Premium Measuement model: Q-Theory Model vs. Fama - French Three-Factor Model, Quarterly Journal of Investment Knowledge, 4.14 (2015): 61-82
[11] V. Mojtahedzadeh, and M. Tarmi, Testing Fama - French three-factor model on the Tehran Stock Exchange to predict stock return, journal of management message, (2005): 109-132.
[12] R. Haugen, Translated by Ali Parsaiyan, Modern Investment Theory, Volume II, Termeh Press, 2006.
[13] R. Haugen, Translated by Gholamreza Eslami Bidgoli et al., Modern Investment Theory, University of Tehran Press, 2007.
[14] A.E. Khamlichi, Persistence of Performance Using the Four-Factor Pricing Model:Evidence from Dow Jones Islamic Index. Working Paper, (2014): 216.
[15] Aharoni, Gil, Bruce Grundy, and Qi Zeng (2013). Stock returns and the Miller Modigliani valuation formula: Revisiting the Fama French analysis, manuscript January.
[16] S. Artmann, P. Finter, and A. Kempf, Determinants of Expected Stock Returns: Large Sample Evidence from the German Market. Journal of Business Finance & Accounting, 39.(5-6) (2012): 758-784.
[17] F. Black, Capital Market Equilibrium with Restricted Borrowing. Journal of Business, 45. 3 (1972): 444–455.
[18] C. Brousseau, The Pricing of Liquidity Risk and Accounting Quality in Canada, Accounting and Finance Research, 4.4 (2015).
[19] M. Carhart, On persistence in mutual fund performance, Jornal of Finance 52 (1977): 57- 82.
[20] D.C. Chiah, A better model? An empirical investigation of the Fama-French (2015): 1-34. Electronic copy available at: http://ssrn.com/abstract=2545379.
[21] M.J. Cooper, H. Gulen and M.J. Schill, Asset Grow and the Cross-Section of Stock Returns, the Journal of Finance 4 (2008): 1609-1651.
[22] E. Fama and A. French, The Cross-Section of Expected Stock Returns, Journal of Finance, 47.2 (1992): 427-465.
[23] E. Fama and A. French, Common Risk Factors in the Returns on Stocks and Bonds, Journal of Financial Economics, 33.1 (1993): 3-56.
[24] E. Fama and A. French, A Five-Factor Asset Pricing Model, Journal of Financial, (2013): 1-51. Economic-shttp://dx.doi.org/10.1016/j.jfineco.2014.10.010.
[25] E. Fama, and A. French, Dissecting Anomalies with a Five-Factor Model (2015). Electronic copy available at: http://ssrn.com/abstract=2503174.74-1.
[26] E.F. Fama, and K.R. French, Common Risk Factors in the Returns on Stocks and Bonds, Journal of financial economics, 33.1 (1993): 3-56.
[27] E.F. Fama, and K.R. French, Multifactor Explanations of Asset Pricing Anomalies, The journal of finance, 51.1 (1996): 55-84.
[28] E.F. Fama, and K.R. French, Industry Costs of Equity, Journal of financial economics, 43.2 (1997): 153-193.
[29] E.F. Fama, and K.R. French, Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay? Journal of Financial economics, 1.60 (2001): 3-43.
[30] E.F. Fama, and K.R. French, Disagreement, Tastes, and Asset Prices, Journal of Financial Economics, 83.3 (2007): 667-689.
[31] E.F. Fama, and K.R. French, Dissecting Anomalies, The Journal of Finance, 63.4 (2008): 1653-1678.
[32] E.F. Fama, and K.R. French, Luck Versus Skill in the Cross-Section of Mutual Fund Returns, The Journal of Finance, 65.5 (2010): 1915-1947.
[33] E.F. Fama, and K.R. French, Profitability, Investment and Average Returns, Journal of Financial Economics 82 (2006a): 491.518.
[34] E.F. Fama, and K.R. French, Financing Decisions: Who Issues Stock? Journal of Financial Economics 76 (2005): 549-582.
[35] S.M. Franke, New asset pricing factors and expected bond returns, (2015): 1-74. http://dx.doi.org/10.2139/ssrn.2569565.
[36] B.D. Grundy, J.S. Martin, Understanding the nature of the risks and the sources of rewards the momentum investing, Working paper, University of Pennsylvania, 1998.
[37] M.T. Hon, and I. Tonks, Momentum in the UK Stock Market, Journal of Multinational Financial Management 13.1 (2003): 43-70.
[38] N. Jegadeesh, and S. Titman, Returns to buying winners and selling losers: implications for stock market efficiency, The Journal of Finance 48.1 (1993): 65-91.
[39] J. Lakonishok, A. Shleifer, and R.W. Vishny, Contrarian Investment, Extrapolation, and Risk, The journal of finance 49.5 (1994): 1541-1578.
[40] J. Lintner, Security Prices, Risk and Maximal Gains from Diversification, The journal of finance 20.4 (1965): 587-615.

[41] H. Markovitz, A Property of Bessel Functions and its Application to the Theory of Two Rheometers, Journal of Applied Physics, 23.10 (1952): 1070-1077.
[42] M.M. Lai, and S.H. Lau, Siok-Hwa Lau Evaluating mutual fund performance in an emerging Asian economy:The Malaysian experience, Journal of Asian Economics 21.4 (2010): 378-390.
[43] R. Novy-Marx, The other side of value: The gross profitability premium, Journal of Financial Economics 108.1 (2013): 1-28.
[44] R. Roy, and S. Shijin, A six-factor asset pricing model, (2018). www.sciencedirect.comdoi.org/10.1016/j.bir.2018.02.00.
[45] Artmann, Sabine, et al. S. Artmann, P. Finter, A. Kempf, S. Koch, and E. Theissen, The cross-section of German stock returns: New data and new evidence, Schmalenbach Business Review 64.1 (2012): 20-43. http://www.ssrn.com.
[46] W.F. Sharpe, Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, Journal of Finance 19. 3 (1964): 425-442.