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The method of stock selection with the intention of portfolio formation

Abstract

The purpose of this study is comparing the method of selecting and forming portfolios. The methods are Capital Assets Pricing Model, Fama and French Model and Excess return model. The methods are transacted in four steps: expected return estimation, stock valuation, selecting portfolios and estimating all kinds of portfolios' returns and risk. In the point of forming portfolios, the decision variables were estimated to compare the methods. There are two questions: are the portfolio forming methods significant at Tehran Security Exchange? And, are there significant differences between methods with the view of generating Expected Rate of Return, Real Return, Risk, Differential Extents of market return and risk-free return? Multivariate Regression, One Way ANOVA and Correlations Tests are used to analyze and test models. The research finding shows that the models have the ability to perform significantly in Tehran Security Exchange. The models were significantly different in five important measures. They are risk, the future actual return, expected return in short and long terms. Finally, it was evidenced that not only there are significant differences between the three models, but also Excess return method was more efficient than the other models.

Keywords: expected return, intrinsic value, book value, market value, firms' size.
JEL Classification: D46, G12, G14, G30, G32.

Introduction

Capital markets are one of the main pillars of economic progress and development. Those markets as a low resource of capital cost not only can bestir the economy, but also can lead it (Haugen R., 1995). The capital markets can gather errant fiscal resource of the economy and make use of it to optimal allocation resource (Haugen R., 1995; Fama, E.F., 1998). The Tehran Security Exchange is emanation of Iran capital markets and has been considered Iran capital markets and, as a result, it has been considered by the researches all over the Iran. The Tehran Security Exchange is a newly established market, even though it has been working for 40 years with a lot of turbulences in these years. More studies and researches are necessary to be done to improve and develop condition of the capital markets to help this sector of economy. The key facility of capital markets is investors and one of the most important ways to exhort them to attend into these markets is reducing the risk of their investment (Fama & French, 1993). The risk reduction depends on accuracy, pellucidity and conclusiveness of investment strategies (Tudor, 2009). These strategies are designed with methods and approaches of capital assets selection. Thus, we know the importance of stock selection models and portfolio selection. The main importance of this research would be doing all of the steps of stock selection and portfolio formation and observing of future factual results by simulation accurately. It must be according to financial and statistical knowledge principals and empirical researches.

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1. Literature review

The theories of portfolio and investment emerged, while portfolio model was formatting by Markowitz (1959), Sharpe (1964) Lintner (1965) and Mossin 1972, Black, Jensen and Scholes tested The Capital Asset Pricing Model and confirmed it. In 1973, Macbeth, Fama, Friend and Bloom also confirmed CAPM (Fama & French, 1992; Haugen R., 1993; Reilly & Brown, 2003).

Then, in 1977, Roll (1983) criticized to CAPM and its tested especially both latest models that funded to directed disruption the tests, then, the age of tests entered to new step (Roll & Ross, 1994; Reilly & Brown, 2003). Despite Cheng, Grower and Gibbons tested CAPM and rejected it, enter the criticism of their methodology (Fama & French, 2004; Rizwan & Rehman, 2014). As for, in 1983, Markowitz (1959) did not believed to success of empirical testes for practical use of The Capital Asset pricing models and The portfolio model (Haugen R., 1993). Fama and French studied effect of firm size and book-to-market equity beside market return on stock return in NYSE and finding showed that firm size has inverse relationship alone to stock return, but it has direct relationship alongside other variable. This research performed by observed many of stock which has too much role in variability of weighted index (Fama & French, 1995; Dennis, Perfect, Snow & Wiles, 1995).

In the model submitted at 1995 by Fama and French, in addition of CAPM's independent variable, they have taken into consideration many other factors include: Firm size, E/P, CF/P, Book-to-Market Equity, Past Sales Growth, Long-term Past Return, and Past Short-term Return. Consequently, they found out that the Fama and French's three factor models contains all exceptional relevance to mean of return mentioned in

CAPM, except continuation of Past Short-term Return (Fama & French, 2004; Reilly & Brown, 2003).

In the Fama's study in 1998 that were due on value and stock growth in international markets field at twenty years period (1975-1995), it was found that the return resulting from value of out of money stock, are more than the return of the stock price that have faster growing. According to the mentioned period, differential average returns of international portfolio was 7.68 % between high and low ratio of Book-to-Market value. In addition value of out of money stocks had surpassed growing of the stock price that have fast grows. On the other hand, CAPM cannot explain risk premium on throughout of international markets, but a two-factor model include risk factors can consider risk premium in estimating return all over the markets (Fama, E.F., 1998; Fama & French, 1998).

After that a research was done and confirms Fama and French's result by Dennis and others in 1995. They not only confirmed the optimal combination involved portfolios of small firms with high BV/MV ratios, but also showed that this superiority prevailed after assuming 1 percent transaction costs and annul rebalancing Dennis, Perfect, Snow & Wiles, 1995).

1.1. Research design. The methodology was designed on a basis of the best and valid method from financial research. In addition, we designed a method that the models and hypothesis are testable and comparable to use the result in Security Exchange. This is a simulation test for examining models as empirical with points of actual time that investor supposed to make a decision in process of portfolio forming. Time period of research divided into two sub periods that the first has begun from March 21st of 2003 to March 2oth of 2008. The data of this set are utilized to estimate required variable include beta and growth rate of dividend per share. Second has begun from March 21st of 2008 to March 20th of 2013.

These years are utilized to do tests and to form, select and make portfolios. Consider that we use data of five years to test models in point of time on sub period of times. Twelve months are added to observe the real return of latest portfolio. They are from 21st March of 2013 from 20th March of 2014. On the whole, our period of time series is eleven years. There are chosen twenty points in second sub period to select stocks and form (create) portfolios. The first point is selected by random, but other points (19 points) are selected by systematic method with an order of one point in per three months. The reason of three months for a one observation is that the variations of effective factors on volatility trend of return of stocks are very clear, so market return and stock return would have observable variation about price and return. First point for testing models and making portfolios is 19th June of 2008. Limited territory (region) of research is Tehran Security Exchange and statistical population is all accepted common stocks (all firms listed) of there.

Statistic sample was selected through 446 stocks by systematic method based on several rules which gathered from valid and reliable researches. Kinds of stocks in population have omitted because of rules and principals. At the end of sampling process, we have 55 statistic samples contain required conditions and data. The samples must not be investment, insurance, banking and holding institute or firms. It is because of the financial structure and dividing per share earn that are different. Samples should be stock of the firms with fiscal year-end at 20th March. It is because of the January Effect that samples have a same price variation. In Iran, fiscal year-ends are at 20th March. We selected the firms that have accepted in Security Exchange before research period. If firm's stocks didn't have trading interruptions, stocks price should have at least minimum of Tick Size.

In twenty points of years for each stock and each models, we estimated *Beta* by regression used three months data at the five time series. In the following, there are Frequency Distributions of samples in Table 1 that are resulted by the filtering process.

Table 1. The result of filtering

All firms before sampling	446
Investment institute	50
Firms that don't have fiscal end-year at 20th March	166
Firms didn't accept before research period	173
Interrupted and low tick size firms	135
Statistical sample	55

1.2. Methodology. This research comprises four steps. First, computing expected rate of return at each point for three models that we use formulas for CAPM and Fama & French models. In the Excess return method, we estimate basic return as expected rate of return (Jensen, 1968; Haugen R., 1993). After this step, Excess return method will be different with other models. Expected rate of return is discounted to calculate instinct value of stocks at each point by CAPM and Fama & French models basis on expected rate of return. Vital factor to valuation based on Dividend Yield that would create and is expected. Dividend Discount Model is used by the Gordon equation (Haugen R., 1993; Reilly & Brown, 2003). According to the following equation 1:

$$v = \frac{D_0(1+g)}{k_e - g}, \quad (1)$$

where v – is intrinsic value of each stock at per point of year of period;
D_0 – is dividend yield at present year including Dividend per Share, Stock Dividend and Warrant;

So, $[D_0(1+g)]$ makes expected dividend yield at future year;
k_e – is expected rate of return that was estimated by CAPM and Fama & French models (Dennis, Perfect, Snow, & Wiles, 1995).

Growth rate of Dividend per Share is estimated separately for each stock and each year by following equation 2:

$$g = \sqrt{\frac{D_1}{D_0}} - 1, \quad (2)$$

where g – is estimated at t;
D_1 – is estimated at t-1 and D_0 at t-2.

Thus, g is stable at the four point of a year and each model (Reilly & Brown, 2003). On the other hand, after estimating basic rate of return and differential return (historical Alpha) in Excess return method, we can create and form the portfolios in the four points of year at five years. Fundamental principal for selecting stock is Alpha (Jensen, 1968). We chose the stocks that have maximum coefficient of Alpha and we will try to make a portfolio contain about 25 to 30 securities at each point.

Second step would finish after calculating the value of per stock for CAPM and Fama & French model at the points. Third step is begun in a process of computing the different value between intrinsic value and market value and portfolio making. In this step, we chose the stocks that the intrinsic value of them is bigger than the market value. There should be approximately twenty five to thirty stocks in each portfolio (Roll, 1983). It is because of diversification, but, as a result of regression and differential value between intrinsic value and market value, in some portfolios, we have fewer than twenty five stocks. At the last of this step, we have twenty portfolios about each model. It is four portfolios in per year for each model, on the whole, sixty portfolios. We identify ten comparable variables to calculation processes at each point. Those comparable variables are the best and suitable for comparing portfolios. There is name of those variables in Table 2.

Table 2. Variables

Historical alpha	X_1
Expected rate of return	X_2
Real return of future season	X_3
Real return of future year	X_4
Average of real returns of future season	X_5
Differences between real return and expected rate of return at short term	X_6
Differences Between real return and expected rate of return at long term	X_7
Differences between real return and market return at short term	X_8
Differences between real return and market return at long term	X_9
Systematic risk (beta)	X_{10}

In this research, not only we test ability of models to determine and compare the excepted rate of returns, but also we compare ability of models to predict and estimate real rate of return. According to research's aims, there are two major hypotheses that both of them are related together. Second hypothesis depends on confirming the first hypothesis. We predict that:

- a_1, the models and methods of selecting stock and forming portfolios are significant and established in Tehran Security Exchange.
- a_2, there is a best efficient model between models and differences between them are significant.

1.3. Capital assets pricing model. The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk (Sharpe, 1964; Lintner, 1965; Fama & MacBeth, 1973; Fama & French, 2004). The CAPM builds on the model of portfolio choice developed by Harry Markowitz. The Markowitz approach is often called a "mean-variance model" (Markowitz, 1959). Tests of the CAPM are based on three implications of the relation between expected return and market beta implied by the model. First, expected returns on all assets are linearly related to their betas, and no other variable has marginal explanatory power. Second, the beta premium is positive, meaning that the expected return on the market portfolio exceeds the expected return on assets whose returns are uncorrelated with the market return.

Third, in the Sharpe-Lintner version of the model, assets uncorrelated with the market have expected returns equal to the risk-free interest rate, and the beta premium is the expected market return minus the risk free rate (Sharpe, 1964; Lintner, 1965; Fama & French, 2004). Sharpe (1964) and Lintner (1965) add two key assumptions to the Markowitz model to identify a portfolio that must be mean-variance-efficient. The first assumption is complete 3 agreements: given market clearing asset prices at t-1, investors agree on the joint distribution of asset returns from t-1 to t. And this distribution is the true one, that is, the distribution from which the returns we use to test the model are drawn. The second assumption is that there is borrowing and lending at a risk free rate, which is the same for all investors and does not depend on the amount borrowed, or lent (Fama & French, 2004). The CAPM assumptions imply that the market portfolio M must be on the minimum variance frontier if the asset market is to clear. This means that the algebraic relation that holds for any minimum variance portfolio must hold for the market portfolio (Fama & French, 2004; Dennis, Perfect, Snow & Wiles, 1995). Specifically, if there are N risky assets, Minimum Variance Condition for M (Sharpe, 1964):

$$E(R_i) = E(R_{ZM}) + [E(R_M) - E(R_{ZM})]\beta_{iM}\ i = 1, \ldots, N, \quad (3)$$

where $E(R_i)$ – is the expected return on asset i and β_{iM}, the market beta of asset i, is the covariance of its return

with the market return divided by the variance of the market return, Market Beta:

$$\beta_{iM} = \frac{COV(R_i, R_M)}{\sigma^2(R_M)}. \quad (4)$$

1.4. Sharp-Lintner CAPM. When there is risk free borrowing and lending, the expected return on assets that are uncorrelated with the market return $E(R_{ZM})$ must equal the risk free-rate, R_f. The relation between expected return and beta, then, becomes the familiar equation (Sharpe, 1964; Lintner, 1965; Fama & French, 2004):

$$E(R_i) = R_f + [E(R_M) - R_f]\beta_{iM}\ i = 1, \ldots, N, \quad (5)$$

where R_f – is the risk-free rate that interested rate of governmental bonds is used as R_f in this research. In the period of research R_f is changed at the middle of time. Consequently, we have used two rate of interest (Tudor, 2009);
$E(R_M)$ – is Market Portfolio rate of return and in this research TEDPIX[4] is calculated as Market Portfolio rate of return.

The premium per unit of beta risk is $E(R_M) - R_f$ or Premium Market.

1.5. Three factors model of Fama and French. Fama and French argued that beta provided little information about the cross- section of common stock returns during the 1963-1988 periods. Instead, firm size and the BE/ME were important determinants of common stock returns (Fama & French, 1998; Fama & French, 2004; Dennis, Perfect, Snow & Wiles, 1995). They confirm that size, earnings-price, debt-equity and book-to-market ratios add to the explanation of expected stock returns provided by market beta. As a result, optimal portfolios are "multifactor efficient" which means they have the largest possible expected returns, given their return variances and the co variances of their returns with the relevant state variables (Fama & French, 1995).

The returns on the stocks of small firms covers more with one another than with returns on the stocks of large firms, and returns on high book-to-market (value) stocks cover more with one another than with returns on low book-to-market (growth) stocks. Fama and French (1995) show that there are similar size and book-to-market patterns in the co variation of fundamentals like earnings and sales. Based on this evidence, Fama and French (1993, 1995) propose a three factor model for expected returns (Fama & French, 2004). The equation of model is:

$$E(R_{it}) - R_{ft} = \beta_{iM}\left[E(R_{Mt}) - R_{ft}\right] + \beta_{is}E(SMB_t) + \\ + \beta_{ih}E(HML_t) + \varepsilon_{it}, \quad (6)$$

where R_{it} – is the return on security or portfolio i for period t;
R_{ft} – is the risk free return;
R_{Mt} – is the return on the value-weight (VW) market portfolio;
SMB_t – is the return on a diversified portfolio of small stocks minus the return on a diversified portfolio of big stocks (small, minus and big s the difference between the returns on diversified portfolios of small and big stocks);
HML_t – is the difference between the returns on diversified portfolios of high and low B/M stocks (high, minus and low is the difference between the returns on diversified portfolios of high and low B/M stocks) and ε_{it} is a zero-mean residual.

The betas are slopes in the multiple regression of R_{it} _ R_{ft} on R_{Mt} _ R_{ft}, SMB_t and HML_t. Treating the parameters in equation as true values rather than estimates, if the factor exposures β_{iM}, β_{iS} and β_{ih} capture all variation in expected returns, the intercept ε_{it} is zero for all securities and portfolios i (Fama & French, 1995; Fama & French, 2004; Dennis, Perfect, Snow & Wiles, 1995). One implication of the expected return equation of the three-factor model is that the intercept α_i in the time-series regression is zero for all assets i. Also ε_{it} is omitted by diversification.

$$E(R_{it}) - R_{ft} = \alpha_i + \beta_{iM}\left[E(R_{Mt}) - R_{ft}\right] + \\ + \beta_{is}E(SMB_t) + \beta_{ih}E(HML_t) + \varepsilon_{it}, \quad (7)$$

For estimating SMB_t, we use firm's monthly returns and then estimate average of monthly return of six portfolios. After that we obtain SMB_t, by this equation:

$$SMB_t = \left[\frac{\left(\frac{S}{L} + \frac{S}{M} + \frac{S}{H}\right)}{3}\right] - \left[\frac{\left(\frac{B}{L} + \frac{B}{M} + \frac{B}{H}\right)}{3}\right]. \quad (8)$$

And also for HML_t the differences between return of big and small firms with high BV/MV and return of big and small firms with low BV/MV. First, we estimate average of monthly return of four portfolios and, then, HML_t is estimated by this equation (Fama & French, 1995; Fama & French, 2004; Dennis, Perfect, Snow & Wiles, 1995):

$$HML_t = \left[\frac{\left(\frac{S}{H} + \frac{B}{H}\right)}{2}\right] - \left[\frac{\left(\frac{S}{L} + \frac{B}{L}\right)}{2}\right]. \quad (9)$$

1.6. Excess return model (differential return). This is a version of Capital Asset Pricing Model. This model is designed based on model of portfolio performance measurement. We use Jensen's model of portfolio performance measurement that it is utilizing

Capital Asset Pricing Model to estimate basis rate of return for comparing portfolios (Jensen, 1968). Jensen was the first to note that the Sharpe-Lintner version of the relation between expected return and market beta also implies a time-series regression test. The Sharpe-Lintner CAPM says that the expected value of an asset's excess return (the asset's return minus the risk-free interest rate, $R_{it} - R_{ft}$) is completely explained by its expected CAPM risk premium (its beta times the expected value of $R_{mt} - R_{ft}$). This implies that "Jensen's alpha," the intercept term in the time-series regression and it is zero for each asset (Jensen, 1968; Dennis, Perfect, Snow & Wiles, 1995). The equation of Time-Series Regression is:

$$R_{it} - R_{ft} = \alpha_i + \beta_{im}\left(R_{mt} - R_{ft}\right) + \varepsilon_{it}. \quad (10)$$

The calculations are done solitary for each stock, and then Jensen's Alpha (Historical Alpha) and basis rate of return are estimated. The stocks that have maximum rate of Alpha have better performance and we set them in portfolios. Basis rate of return is estimated by:

$$R_b = R_f + [E\left(R_M\right) - R_f]\beta_{iM}$$

$$Alpha = R_i - R_b. \quad (11)$$

Historical Alpha is a difference between the average real rate of return through past time series and basis rate of return. Other variables are same to CAPM except β_{iM} that is slope of regression line with $E(R_M) - R_f$ as independent variable and (R_i) as dependent variable in CAPM, but, in this model, dependent variable is difference between (R_i) and (R_f) (Jensen, 1968).

1.5. Models' testing. In the first step we, use simple linear regression to estimate beta of stock return to market, size and BV/MV. The acceptable significant level is under 0.06. We regress all stocks by three models at twenty points and stocks bring to next step, if they earn significant level under 0.06 otherwise dummy variables are added into models testing. Normality of data is measured by Kolomogorov-Smironov test over 0.5 and testing nonstandard residuals by P-P Plot. Data independency is measured by Durbin-Watson test and standardized residuals are tested by graph-scatter in all regressions for testing homogeneity of residuals variance. Because of the Fama and French's multivariate linear regression, we have done Pearson Correlation Tests. Acceptable significant level is under 0.05 otherwise, one of the independent variables was omitted. We calculate variance, standard deviation, coefficient variation, semi variance and semi standard deviation for every ten variables at twenty perceived point of time period to use in final comparing. The latest tests are designed to measure significant differ of models according to generate real return, excepted rate of return, risk and other comparable variables. Then, we were comparing ten variables by ten tests in One Way ANOVA to observe behavior of models. We compared models two by two in Tukey-Kramer test, and the results were found.

2. Result and discussion

In CAPM, 342 exams were accepted by 1100 regressions and, on the whole, 270 stocks entered portfolios. Finding shows in 31% of times market, as a variable has the ability to clarify stocks' return and 24% of stocks have validity to be predicted by CAPM. In Fama and French's model, 342 exams were accepted by 1100 regressions and, on the whole, 267 stocks entered portfolios. Therefore, in 34% of observations independent variables have significant ability to clarify stocks' return. Excess return model is stable and significant model to clarify stocks' return and is able to imply in empirical tests. In this model, 63% of stocks were able to make portfolios; it means the market has ability to clarify stocks' return.

Following, there are statistical results of comparing three models by the view of comparable measures from X_1 to X_{10}.

2.1. Historical Alpha, Jensen's measure, X_1. We predict the approaches to select and form portfolios are different in Historical Alpha. More formally:

H_0 = the portfolio selection models won't have significant differences in Alpha generation.
H_1 = the portfolio selection models will have significant differences in Alpha generation.

Table 3. ANOVA

	Sum of squares	df	Mean square	F	Sig.
X_1 between groups	798.861	2	399.430	36.460	0.000
Within groups	624.453	57	10.955		
Total	1423.314	59			

The test is accepted at three stars level and by the point of Sig = 0.000, H_0 is rejected and it means three models are not similar to generate alpha. Alpha that is differential extent between real return and excepted rate of return is a measure of portfolio performance. By the following Table 4, the Alpha of Excess return model is 8.594182963 and it means this model is better than others by the view of Alpha measure.

Table 4. Alpha of Jensen mode

Models	Alpha
Excess return	8.594182963
Fama and french's model	1.997051342
CAPM	0.073265947

Following Table 5 is comparing models two by two in Tukey-Kramer test.

Table 5. T.K Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
				Lower bound	Upper bound
X_1 CAPM excess return	-8.252092	1.04668	0.000	-11.0397	-6.0022
CAPM Fama & French	-1.92379	1.04668	0.167	-4.4425	0.5950
Excess Return Fama & French	6.59713	1.04668	0.000	4.0784	9.1159

According to Table 5 there are two significant differences between CAPM-Excess return and Excess return- Fama & French. Historical Alpha is generated by Excess return is so significant different and shows Excess return is very reliable to predict expected rate of return and to form portfolios.

2.2. Expected rate of return, X_2. We expect that greater extent of expected rate of return will be generated by models differently.

Thus, H_0 = the portfolio selection models won't have significant differences in estimating the expected rate of return.
H_1 = the portfolio selection models will have significant differences in estimating expected rate of return.

Table 6. ANOVA

	Sum of squares	df	Mean square	F	Sig.
X2 between groups	192.492	2	96.246	6.212	0.004
Within groups	883.080	57	15.493		
Total	1075.572	59			

The test is accepted at two stars level and by the point of Sig = 0.004, H_0 is rejected and it means three models are not similar to estimate expected rate of return.

Table 7. Alpha of Jensen model

Models	Alpha
Excess return	4.271030502
Fama and French's model	7.76524227
CAPM	8.315914478

Table 8. T.K. Test

Dependent (I)k (J)k Variable	Mean difference (I-J)	Std. Error	Sig.	95% Confidence interval	
				Lower bound	upper bound
X_2 CAPM excess return	4.04488	1.24469	0.005	1.0496	7.0401
CAPM Fama & French	0.55067	1.24469	0.898	-2.4446	3.5459
Excess return Fama & French	-3.49421	1.24469	0.018	-6.4895	-0.499

Looking at Table 8, we find that CAPM has significant difference with Excess return at the level of 0.005. In contrast, there is no difference between CAPM and Fama & French, but there is sa ignificant level about 0.018 between Excess return and Fama & French.

2.3. Real return of future season, X_3. It is expected to be deferential generating about real return between models at three months of future. The hypotheses are:

H_0 = the portfolio selection models won't have significant differences in generating the real return (three monthly).
H_1 = the portfolio selection models will have significant differences in generating the real return (three monthly).

Table 9. ANOVA

	Sum of squares	df	Mean square	F	Sig.
X_3 between groups	57.737	2	28.869	0.552	0.579
Within groups	2981.048	57	52.299		
Total	3038.785	59			

As significant level that is 0.579, H_1 is rejected and it means there are no differences between models in real return of three months of future. Nonetheless, according to Tukey-Kramer test, there is a bit difference between Excess return and CAPM that it isn't statistical significance.

Table 10. Alpha of Jensen model

Models	Alpha
Excess return	2.333426667
Fama and French's model	0.438454808
CAPM	0.106451293

Table 11. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_3 CAPM excess return	-2.22698	2.2869	0.596	7.7302	3.2763
CAPM Fama & French	-0.332	2.2869	0.988	-5.8352	5.1712
Excess return Fama & French	1.89497	2.2869	0.687	-3.6083	7.3982

2.4. Real return of future year, X_4. We argue that there are significant differences between models as generating real return of future year. More formally:

H_0 = the portfolio selection models won't have significant differences in generating the real return (yearly).
H_1 = the portfolio selection models will have significant differences in generating the real return (yearly).

Table 12. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_4 between groups	395.819	2	197.910	0.912	0.407
Within groups	12365.223	57	216.934		
Total	12761.043	59			

Table 13. Alpha

Models	Alpha
Excess return	2.016387248
Fama and French's model	0.983061836
CAPM	0.207637153

Table 14. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_4 CAPM excess return	-6.22706	4.65761	0.381	-17.4352	4.9811
CAPM Fama & French	-2.33622	4.65761	0.781	-13.5444	8.8719
Excess return Fama & French	3.890804	4.65761	0.683	-7.3173	15.0990

Looking at Table 12 significant level is 0.407 that it lead the H_1 to reject. According to Table 13, the Alpha of Excess returns model is about 2.01 and there is a difference between three models, that is, some extent.

2.5. Average of real returns of future season, X_5. There is an argue that there are significant differences between models to generate average of real returns of future season. More formally,

H_0 = the portfolio selection models won't have significant differences to generate the real return (seasonal average).
H_1 = the portfolio selection models will have significant differences in generate the real return (seasonal average).

Table 15. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_5 between groups	25.803	2	12.901	0.945	0.395
Within groups	777.971	57	13.649		
Total	803.733	59			

Table 16. Alpha

Models	Alpha
Excess return	2.462385
Fama and French's model	1.489674652
CAPM	0.868971106

Table 17. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_5 CAPM excess return	-1.59341	1.16827	0.366	-4.404	1.2179
CAPM Fama & French	-0.62070	1.16827	0.856	-3.4321	2.1906
Excess return Fama & French	0.97271	1.16827	0.684	-1.8386	3.7841

Table 15 shows significant level is 0.395 and it means H_1 is rejected. The return of Excess return model is about 2.46 and 1.489 for Fama and French's model there are differences between three models but not significant.

2.6. Differences between real return and expected rate of return at short term, X_5. We argue that the models are different about differential extent between real return and expected rate of return. More formally,

H_0 = the portfolio selection models won't have significant differences to generate differential extent between real return and expected rate of return at short term.
H_1 = the portfolio selection models will have significant differences to generate differential extent between real return and expected rate of return at short term.

Table 18. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_6 between groups	461.058	2	230.529	3.696	0.031
Within groups	3555.571	57	62.378		
Total	4016.629	59			

Table 19. Alpha

Models	Alpha
Excess return	-1.937603835
Fama and French's model	-7.326787462
CAPM	-8.209463186

Table 20. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_6 CAPM excess return	-6.27186	2.49757	0.039	-12.2821	0.2617
CAPM Fama & French	-0.88268	2.49757	0.934	-6.8929	5.1275
Excess return Fama & French	5.38918	2.49757	0.087	-0.6210	11.3994

Table 18 shows significant level is 0.031 and it means H_0 is rejected. The Alpha of Excess return model is about -1.937 and -7.326 for Fama and French's model there are differences between three models on the level of one star.

2.7. Differences between real return and expected rate of return at long term, X_7. It is expected that the models are different about differential extent between real return and expected rate of return. More formally,

H_0 = the portfolio selection models won't have significant differences to generate differential extent between real return and expected rate of return at long term.

H_1 = the portfolio selection models will have significant differences to generate differential extent between real return and expected rate of return at long term.

Table 21. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_7 between groups	354.106	2	177.053	4.825	0.012
Within groups	2091.729	57	36.697		
Total	2445.835	59			

Table 22. Alpha

Models	Alpha
Excess return	-1.808645502
Fama and French's model	-6.27556719
CAPM	-7.446943373

Table 23. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_7 CAPM excess return	-5.63803	1.91565	0.013	-10.2481	-1.0285
CAPM Fama & French	-1.17138	1.91565	0.814	-5.7812	3.4385
Excess return Fama & French	4.46692	1.91565	0.059	-0.1429	9.0768

Table 21 shows the models are not differences at short and long term. As *sig* is 0.012, we can know H_0 is rejected at level of two stars and there are significant differences between CAPM and Excess return models.

2.8. Differences between real return and market return at short term, X_8. We expect that the models are different about difference of real return and market return at short term. Thus,

H_0 = the portfolio selection models won't have significant differences between difference of real return and market return at short term.

H_1 = the portfolio selection models will have significant differences between difference of real return and market return at short term.

Table 24. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_8 between groups	57.737	2	28.869	0.587	0.559
Within groups	2804.676	57	49.205		
Total	2862.413	59			

Table 25. Alpha

Models	Alpha
Excess return	1.499426667
Fama and French's model	-0.395545192
CAPM	-0.727548707

Table 26. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_8 CAPM excess return	-2.22698	2.21822	0.577	-7.5649	-3.1110
CAPM Fama & French	-0.33200	2.21822	0.988	-5.6700	5.0060
Excess return Fama & French	1.89497	2.21822	0.671	-3.4430	7.2329

There is no different between models, but Excess Return model has made a bit better return.

2.9. Differences between real return and market return at long term, X_9. We argue that the models are different about differences between real return and market return at long term. We predict that:

H_0 = the portfolio selection models won't have significant differences between difference of real

return and market return at long term.

H_1 = the portfolio selection models will have significant differences between difference of real return and market return at long term.

Table 27. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_9 between groups	25.803	2	12.901	1.150	0.324
Within groups	639.611	57	11.221		
Total	665.414	59			

Table 28. Alpha

Models	Alpha
Excess return	2.123785
Fama and French's model	1.151074652
CAPM	0.530371106

Table 29. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_9 CAPM excess return	-1.59341	1.05930	0.297	-4.1425	0.9557
CAPM Fama & French	-0.62070	1.05930	0.828	-3.1698	1.9284
Excess return Fama & French	0.97271	1.05930	0.631	-1.5764	3.5218

In long term, the models are similar.

2.10. Systematic risk (Beta), X_{10}. Systematic risk is one of the most important factors to analyze stocks and firms. On the other hand, beta is the best measure of risk and we argue the models are not same as risk measuring. We, therefore, predict the following:

H_0 = the portfolio selection models won't have significant differences in measuring risk and beta.

H_1 = the portfolio selection models will have significant differences in measuring risk and beta.

Table 30. ANOVA

	Sum of squares	df	Mean square	F	Sig
X_{10} between groups	104.171	2	52.086	23.434	0.000
Within groups	126.689	57	2.223		
Total	230.861	59			

Table 31. T.K. Test

Dependent (I)k (J)k variable	Mean difference (I-J)	Std. error	Sig.	95% Confidence interval	
				Lower bound	Upper bound
X_{10} CAPM excess return	2.6305	0.47145	0.000	1.4960	3.7650
CAPM Fama & French	2.93487	0.47145	0.000	1.8004	4.0694
Excess return Fama & French	0.30436	0.47145	0.769	-0.8301	1.4389

There are significant differences between models to form portfolios with different risk that is measured by beta (β).

Conclusion

According to results we are admit the major hypotheses (a_1, a_2), that were related together. Following we have seasonal average of returns of each models' portfolio, market return and free risk return. Then differences between models' return and market and free risk return are as following Table 32.

Table 32. Returns and differences between variables

Models	Portfolio's return	Market return	Free risk return	Return of models' portfolio minus market return	Return of models' portfolio minus free risk return
CAPM	0.869	0.3386	4.25	0.5304	-3.381
Fama & French	1.489	0.3386	4.25	1.1504	-2.761
Excess return	2.462	0.3389	4.25	2.1234	-1.788

Tbable 32 shows that there is 2.1234 difference between portfolios' return of Excess return model and return of market and it is a notable point from that model. In contrast, all models have negative result in comparison with free risk return. It can be cause of high interest rate at monetary market in IRAN.

According to Table 33, there are variance and semi variance of real return of future season that are generated by models. Variance represents total risk and semi variance represents downside risk. Excess return model has more downside risk. We also can calculate $\frac{\text{var}}{2}$ that is measure to comprise with semi variance. In Fama & French model and Excess return model $\frac{\text{var}}{2} > SEMVAR$ and we finding that there are skewness to right.

Table 33. Variance and semi variance

Models	Variance	Semi variance	Variance / 2
CAPM	0.000695	0.000393	0.0003457
Fama & French	0.001666112	0.000675	0.0008333
Excess return	0.001528509	0.000722	0.0007642

In conclusion, the three models are able to be tested in capital market of Iran. There are significant differences between models in expected rate of return. excess return model creates portfolios better than the others by the point of return and level of risk.

Notes

1. CAPM.
2. Earning to price ratio.
3. Cash flow to price ratio.
4. Tehran dividend and price index.
5. $55 \times 20 = 1100$ samples and 20 points of five years.

Highlights

- We expect to find differences between CAPM, Fama and French and Excess return models as generating expected rate of return.
- According to return, systematic risk, and downside risk: there are significant differences between models.
- Excess return model has significant difference with others by the view of return, systematic risk, and downside risk.

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