



# Studying the Expected Returns Based on Carhart Model Compared to CAPM Model and Implicit Capital Cost Model Based on Cash and Capital Flow of Growth and Value stocks

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## ABSTRACT

The purpose of this study was to examine the expected returns of Carhart model compared to the capital asset pricing model and the implicit capital cost model based on cash and capital returns of growth and value stocks. The statistical population consisted of the companies listed in Tehran Stock Exchange and the time domain is between 2007 and 2016. By choosing Cochran sampling, 126 companies were selected as the statistical sample. The present research is an applied research and is naturally a descriptive study. Descriptive and inferential statistics were used to describe the data, and to analyze the data, SPSS software was used. Also, the results showed that there is a significant difference between the mean of total returns and returns from the capital profit of growth and value stock; while there is no significant difference between the average cash flow of growth and value stocks. In addition to growth stocks, the expected returns on the basis of Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model. But about value stock, the expected returns on the basis of Carhart model are not closer to actual returns compared to expected returns based on the capital asset pricing model and the cost of capital, and ultimately for growth stocks, expected returns based on Carhart model compared with expected returns, the implicit capital cost model is closer to actual returns.

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## 1 Introduction

One of the predictive models for expected stock returns is the one-factor model of capital asset pricing, but due to the defects of this model, models such as FamaFrench and Carhart were introduced. The Capital Asset Pricing Model has been used to calculate capital costs and measure the performance of portfolio investment since the 1970s. In the 1990s, Fama and French showed that the capital asset pricing model was not performing well and proposed a three-factor model; in 1997, Carhart's four-factor model was proposed, which had even better performance than the Fama and French

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model. As expected, professional and academic communities quickly switched to these two new models, and in recent years, these two models have been widely used for empirical reasons that showed the two models outperform [19]

According to the research, new evidence has been discovered about the best available stock for market investment, how to increase corporate capital, how to determine the rules for tools, and how to estimate the cost of corporate capital. The evidence is a massive amount of valuable information for investing, which investors use in accordance with the capital asset pricing model, and expected returns from a common stock are determined by risk-free returns and risk-taking that is a function of beta. According to this theory, investors in the market investing in a portfolio, the only risk that they accept and the market rewards those risks, is a systematic risk. Recent evidence suggests that in addition to beta, the book value ratio to market value and firm size are also priced in the market. Stocks that are priced below the intrinsic value for some reason seemed to have a high ratio of book value to market value. In contrast to those stocks with high growth rates in sales and profits, they have a lower book-to-market value. However, high book-to-market value may seem to mean that stocks are in a cheap market and it means that stocks are expensive. That's why some investors, when buying follow an acceleration strategy or buy stocks that have lower book-to-market value. Therefore, in the present research, we seek to answer the following basic questions: Is the expected returns of Carhart model have more explanatory power comparing the capital asset pricing model and the implicit capital costs?

## 2 Theoretical Foundations and Development of Research Hypotheses

Studies conducted in financial markets showed that the average return on value stocks (stocks with high book-to-market value) is higher than growth stocks (stocks with low book-to-market value) [20], [9], [17]. [10] explained the reason for the difference in returns of the two shares, that stock returns are often divided into two distinct parts, namely cash returns from dividends and returns from capital gains. They by splitting up the returns from capital gains into two distinct parts, namely, the growth rate of book value and the growth rate of market-to-book value concluded that after identifying a share as a value stock, the growth rate of book value of equity (by maintaining the profit) is almost zero. Therefore, the high rate of return on capital gains is almost entirely due to the growth of the market-to-book value. On the other hand, after identifying a share as a growth stock, the average ratio of market-to-book value decreases and, instead, the growth rate of book value of equity increases, while some of the studies conducted in the Iranian capital market also showed that unlike the results of the Fama and French studies, growth stocks have had higher average returns compared to value stocks. Therefore, the first to third hypotheses are formulated as follows:

First hypothesis: There is a significant difference between the average returns of growth stocks and value stocks.

Second hypothesis: There is a significant difference between the average returns from the capital profit of growth and value stocks.

Third hypothesis: There is a significant difference between the average cash returns of growth and value stocks.

The initial empirical tests of capital asset pricing model have proven their pivotal prediction based

on the existence of a positive linear relationship between systematic risk (beta) and stock returns, nevertheless, the results of recent studies indicated that the beta coefficient as an indicator of systematic risk does not explain the difference in the average return on equity, and except the beta, there are other variables that are not within the framework of the local asset pricing model, such as firm size, book value to market value, profit/loss ratio, and financial leverage that play an effective role in explaining the difference in stock returns [2]. Banz [3] stated that the share of small firms shows higher returns than those predicted by the capital asset pricing model. There are, in fact, numerous risks associated with the company, while in the capital asset pricing model; only one factor is used to describe the total risks. Lam [18] revealed deviations and abnormalities of capital asset pricing model.

After the capital asset pricing model, Fama and French [8] suggested evidence of empirical failures in the capital asset pricing model and confirmed that the size of the company, the size of the ratio of profit to price, and the ratio of book value to market value in addition to market beta have an essential role in explanation of the expected return and there is a significant relationship between the average, returns and beta of the stock. Also one of the multi-factor models is Carhart model. This model is a three-factor model of the Fama and French model, which Carhart invented in 1997 with this four-variable model by adding a new variable called acceleration factor. The Carhart model was later tested by Su and Chen and they showed that this four-variable model has more power in predicting returns than the three-variable Fama and French model and the single-variable model of capital asset pricing. Therefore, the following hypotheses are presented:

Fourth hypothesis: For growth stocks, the expected returns on the basis of Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model.

Fifth hypothesis: For value stocks, the expected returns on the basis of Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model.

Sixth hypothesis: For value stocks, the expected returns on the basis of Carhart model are closer to real returns compared to expected returns based on the implicit capital cost model.

Seventh hypothesis: For growth stocks, the expected returns based on Carhart model are closer to real returns compared to expected returns on the basis of the implicit capital cost model.

### 3 Research Background

Hou et al. [14], showed that real returns are not an appropriate indicator for predicting expected returns, and predicted returns through a method of implicit capital cost compared with actual returns have a more meaningful relationship with company characteristics. Jacquelyn and Brien [15] believed that investors tend to keep less capital in stocks. In addition, in the short-term, all the winning and losing portfolios have a positive relationship with the acceleration factor. This factor recommends investors to keep past winning stocks and sell past losing stocks. Blazenko and Yufen [5] stated that increasing returns with increased profitability is more for value stock rather than growth stocks. Artmann et al. [21] confirmed earlier evidence of the strong impact of the acceleration factor on the German capital market, but this test did not provide evidence of book-to-market value and size factors. The results of capital asset tests were not desirable for these models. The four-factor model was

the best model among others. Chen and Zhao [7] studied the phenomenon of stock movements, and consider its origins as news momentum about corporate profits, and said that sudden news about corporate profits encourage investors to change their prospects for future cash flows and future prices of the company's stock and thereby creating value and size factors. Glen and Zhang [13] stated that in adapting to bad economic conditions, price formation firms have less flexibility than growth companies, which will increase their cost of capital. Fama and French [10] stated that the origin of the size factor is a tremendous positive return that made small-sized companies, thus turning into large-sized companies. Bartholdy and Pear [4] argued that the best period for beta estimation is a five-year period, and despite the support provided for the Fama and French model and the criticisms to Kepem model, the Fama and French model is not stronger than Kepem model to predict the expected returns. Botosan et al. [6] argued that the expected cost estimate is due to the discounted model of dividend of ordinary shares.

Babaloyan and Mozafari [1] found that among factors of beta, size, value, tendency to past performance (momentum), profitability and investment, it can be said that momentum and investment factors do not affect in stock returns. Jahanshad and Parsa [16] believed that there is a positive and significant relationship between liquidity, potential growth, stock price level, company value, and firm size with expected returns based on the implicit capital cost model. There is also a negative and significant relationship between long-term return on capital, financial leverage, and systematic risk with estimated expected returns based on the model of implicit capital cost. Foroughi and Matinnejad [11] stated that the size, book value to market value and financial leverage have a positive and significant effect on expected returns based on of implicit capital cost model. Also, the growth rate of assets has a negative and significant effect on this returns. Ghafouri Rad [12] stated that in both trading cycles of boom and bust of the Iranian capital market, there was no significant difference between expected returns based on the Carhart's four-factor model and the actual returns and the Charter model's four-factor model in anticipation of expected returns performs well. Pourzamani and Bashiri [19] found that growth stocks have higher returns. Also, to increase the reliance of research, the results obtained by Carhart were compared with real data, which showed that the returns from this model did not differ significantly from the actual information.

## **4 Proposed Methodology**

This research is a correlation study in terms of nature and method and based on the purpose is an applied study. Data was collected by library method and by referring to the financial statements, explanatory notes and with the programs of Raheed Novin and Tadbir Pardaz.

### **4.1 Statistical Population and Sample Selection**

The statistical population is all companies listed on Tehran Stock Exchange in the period from 2007 to 2015. The statistical sample obtained by the Cochran formula consisted of 126 companies.

### **4.2 Model and Research Variables**

The method used to test the research hypotheses is presented below:

The first, second and third hypotheses:

First, the actual return on each ordinary share (TR<sub>it</sub>) is calculated on the basis of stock price fluctuations, cash profit, dividend, and capital increase. Total returns can be calculated using model (1):

$$TR_{it} = \frac{S_1 - S_2 + S_3 - S_4}{S_5 + S_4} \quad (1)$$

in which,

S<sub>1</sub>=Stock value at the end of the year

S<sub>2</sub>=Stock value at the beginning of the year

S<sub>3</sub>=Cash profit

S<sub>4</sub>=Cash investment of investors

S<sub>5</sub>=Stock value at the beginning of the period

Then, the returns from capital profit of growth and value stocks (CR<sub>it</sub>), which includes a portion of the stock return and is related to the increase of the stock market value, is calculated in model (2):

$$CR_{it} = \frac{S_1 - S_2 + S_3 - S_4}{S_5 + S_4} \quad (2)$$

Also, cash returns from growth and value stock (DR<sub>it</sub>) which is related to a portion of the return on equity and is related to cash dividends, can be calculated as follows in the model (3):

$$\text{cash returns} = \frac{\text{cash profit of stocks}}{\text{stock value at the beginning of period} + \text{cash investment of investors}} \quad (3)$$

The method of analysis of variance (ANOVA) is used and to control the effect of size on stock returns, the hypotheses test was carried out in the form of three portfolios V-G, BV-BG and SV-SG. In order to test the first three hypotheses of the research at the beginning of each year, all companies are arranged in size from the smallest to the largest, then using the median, the companies are divided into two groups of small size (S) and large size (B) companies. Then the companies are ranked in the order of the book value to market, from the lowest to the largest, and divided into three separate categories.

Thus, the first 30 percent is called Growth Stocks (G) with the lowest ratio of book value to market value, second 40% is called neutral shares (N) as mid-term and 30% of last-rated shares is called value stocks (V) with the highest ratio of book value to market value. Finally, from the combination of two categories of size and three classes of the book value to the market value, six portfolios were formed as follows:

(A) Growth stock portfolios SG and BG; stocks with low market-to-book value and small and large size.

(B) Neutral stock portfolios SN and BN; stocks with a mid-range book-to-market ratio and small and large sizes.

(C) Value stock portfolios BV and SV; stock with a high book-to-market ratio and small and large sizes.

These six portfolios are revised at the beginning of each year, and companies can be moved into different portfolios depending on the size or ratio of book value to market value. This approach reflects the dynamic nature of companies in the stock market and the variability of the characteristics of risk and corporate returns.

Fourth and fifth hypotheses:

The expected returns are calculated based on the performance model and capital asset pricing model:

(A) expected returns based on Carhart model is presented as model (4):

$$R_{pt} - R_{ft} = \beta_p (R_{mt} - R_{ft}) + s_p (SMB_t) + h_p (HML_t) + p_p (WML_t) + \varepsilon_p \quad (4)$$

$R_{ft}$ : Risk free returns

$\beta$ : is the systematic risk of assets or portfolios

$R_m$ : Portfolio returns at time  $t$

$SMB$ : is the average returns for small companies minus large corporations.

$HML$ : The average returns for companies with high book value ratios minus low ratios.

$WML$ : The difference between the average stock portfolio of the winners and losers.

Thus, after extracting the company size data (SML) based on the product of the number of shares of the company in the stock price of the company at the share price, the shares of the companies are initially divided by size into separate portfolios of large companies' B and small companies of S. How to create portfolios is that sample firms are arranged in size. Then, two large (B) and small (S) portfolios are classified. After classifying the shares of companies based on two factors, the size and the ratio of book value to market value, the stocks are divided into six portfolios S/N, S/L, B/M, B/H, B/L, S/H, which are the sum of the two groups of size and the ratio of book value to market value, and the factor size is calculated by model (5):

$$SMB = \frac{S/L + S/M + S/H}{3} - \frac{B/L + B/M + B/H}{3} \quad (5)$$

After classifying the stocks based on the size, the samples are classified according to the ratio of book value to market value (HML) to separate portfolios. Companies are ranked from top to bottom according to this ratio, and companies that their book-to-market value ratio is in top 30%, are classified as high portfolios (H) and stocks that their book-to-market value ratio is in next 40% are classified as medium portfolio and finally stocks that their book-to-market value ratio is in bottom 30% are considered as low portfolios (L), and the factor of book-to-market value ratio is calculated by model (6):

$$HML = \frac{S/H + B/H}{2} - \frac{S/L + B/L}{2} \quad (6)$$

For the acceleration factor (WML), the shares were first categorized based on the size of the stocks and the stock returns of the past year were categorized as separate portfolios and then the companies whose average return on stock portfolios in last year ranked in top 30% considered in the winning portfolio (W), and shares with average returns last year of their stock portfolios were in 40% median considered in the medium portfolio and shares whose average returns in last year were in bottom 30%

considered in the losing portfolio (L) and the factor of acceleration is calculated from the model (7):

$$WML = \frac{S/W + B/W}{2} - \frac{S/LO + B/LO}{2} \quad (7)$$

According to the materials mentioned, six portfolios have been created:

S/LO, S/NU, S/W, B/LO, B/NU, B/W

B) expected returns based on capital asset pricing model calculated as model (8):

$$E(R_i) = R_f + \beta (R_m - R_f) \quad (8)$$

( $R_i$ ): Expected returns

$R_f$ : Return without risk

$\beta$ : is the beta coefficient

( $R_m$ ): Expected returns of the market

(The risk-free rate of return in this research is equal to the average interest rate of deposit during the research period.)

The sixth and seventh hypotheses:

The expected returns based on Carhart model are presented in the previous hypotheses, here we present the expected returns computed by the implicit capital cost method:

The present research is aimed at predicting the company's expected earnings in the first stage, and then expected earnings are used to calculate the expected return rate. To predict the expected earnings, combined data and a multivariate regression model based on [14] research have been used as follow in model (9):

$$E_{it+\tau} = \alpha_0 + \alpha_1 A_{it} + \alpha_2 D_{it} + \alpha_3 E_{it} + \alpha_4 AC_{it} + \varepsilon_{it+\tau} \quad (9)$$

Firstly, the coefficients of the above model are estimated using the five-year data of the companies and in the next step, to predict the company's five-year profit, the estimated coefficients in the previous step are used and as a result, five profit-generation models are obtained. So that using the information for year  $t$  and profit for next year ( $E_{t+1}$ ), the model is estimated to predict the earnings of a future year, then using the same information (independent variables) of year  $t$ , but this time with considering the profit for the next two years ( $E_{t+2}$ ), the model is estimated to predict the profit of the next two years, so by keeping the information for year  $t$  and the change in earnings up to next five years, each of profit forecast models for the next five years is estimated. In this model:

$E_{it+T}$ : Expected profit for  $t+T$  period  $t$  of the company  $i$  in period  $t$

It should be noted that in the first model, the profit of a future period ( $E_{t+1}$ ) in the second model, the profit for the second period of the future ( $E_{t+2}$ ), and so in the fifth model, the profit for the forthcoming 5th period ( $E_{t+5}$ ) forecasted.

$A_{it}$ : total assets total

$D_{it}$ : dividends of the company

$E_{it}$ : net profit of the company

AC<sub>it</sub>: accruals, obtained from model (10):

$$AC_{i,t} = OE_{i,t} - OCF_{i,t} \quad (10)$$

where:

OCF<sub>it</sub>: corporate cash flow

OE<sub>it</sub>: operating profit

Using five models derived from the model (9) whose coefficients are estimated based on five years ago, and with the use of companies' data in the next five years, profit is projected for each of to five years later. In the second step, to calculate the expected return rate of the stock, model (11), the GLS model, was used:

$$M_t = B_t + \sum_{t=0}^4 \frac{E_t[(ROE_{t+K} - R) \times B_{t+K-1}]}{(1 + R)^K} + \frac{E_t[(ROE_{t+5} - R) \times B_{t+4}]}{R \times (1 + R)^4} \quad (11)$$

where:

R: expected return on equity in year t+1

M: Market value of equity at the end of year t

B: The book value of equity at the end of year t

E(): Market expectations in year t

ROE: The expected return on equity in the period t+k, which is derived from model (12):

$$ROE_{t+k} = \frac{E_{t+k}}{B_{t+k}} \quad (12)$$

where:

E<sub>t+k</sub> is the expected profit of the period t+k calculated from the model (9).

B<sub>t+k</sub> is the book value of the equity in the period t+k calculated using the model (13):

$$B_{t+k} = B_{t+k-1} + E_{t+k} - D_{t+k} \quad (13)$$

Where:

B<sub>t+k-1</sub>: The book value of equity in the period prior to the forecast period.

D<sub>t+k</sub>: The expected dividend of the period t+k, calculated through the model (14):

$$D_{t+k} = (1 + g_t)D_{t+k-1} \quad (14)$$

Where:

g is dividend growth rate obtained from model (15):

$$g_t = \frac{D_{t+k-1} - D_{t+k-2}}{D_{t+k-2}} \quad (15)$$

The classification of variables is discussed as follows. The only dependent variable is:

(A) The actual return on each ordinary share (TR<sub>it</sub>)



Independent variables are as follows:

- (A) The expected returns based on Carhart model
- (B) Expected returns based on capital asset pricing model
- (C) Expected return based on the model of implicit capital cost

Also, in this research the moderator variables are considered as follows:

- (A) Average return on growth and value equity
- (B) The average returns from the capital profit of growth and value stock (CRit)
- (C) The average cash returns of growth and value stocks (DRit)

## 5 Research Findings

### 5.1 Descriptive Statistics of Research Variables

Before testing the research hypotheses, the variables are summarized in the Table 1.

**Table 1:** Indicators Describing the Variables of Research

Expected returns of the implicit capital cost model	Cash returns from value stocks	Returns from capital profit of value stocks	Total returns of value stocks	Cash returns from growth stocks	Returns from capital profit of growth stocks	Total returns from growth stocks	
190	190	190	190	190	190	190	Numbers
7.9266	2.6424	0.0663	2.5771	0.9359	0.0784	0.8576	Average
0.475	0.3000	0.0000	0.2300	0.2350	0.0000	0.1900	Median
28.48457	1.18218	0.26679	1.17954	1.98258	0.27335	1.91285	Standard Deviation
5.263	6.931	5.450	6.963	4.349	3.792	4.235	Skewness
29.715	51.221	33.178	51.703	23.871	13.800	21.749	Kurtosis
-7.29	0.00	0.00	0.00	0.00	0.00	0.00	Minimum
214.78	106.32	2.00	106.32	15.78	1.51	14.56	maximum

### 5.2 Normality of Dependent Variables

Since the normalization of variables leads to the normalization of the model's remnants, the Kolmogorov-Smirnov test has been used to study normality and the results are presented in Table 2.

**Table 1:** Continue

	Expected returns from growth CAPM model	Expected returns from growth Carhart model	Growth real returns	Value real returns	Expected returns from value implicit capital cost	Expected returns from value CAPM model	Expected returns from value Carhat model
Numbers	190	190	190	190	190	190	190
Average	0.3916	1.2520	0.3519	0.4391	1.2520	-1.0918	0.2584
Median	0.1500	0.0400	0.2500	0.3500	0.0400	0.5300	0.1400
Standard deviation	2.07237	2.38445	0.56541	0.59980	2.38445	32.72500	0.46454
Skewness	2.07237	2.38445	0.56541	0.59980	0.244	-10.133	0.232
Kurtosis	162.315	-1.559	3.320	0.853	-1.559	122.171	3.853
Minimum	-4.38	-1.75	-0.62	-0.79	-1.75	-415.01	-2.04
maximum	27.72	4.56	2.95	2.85	4.56	60.80	1.98

Source: Researcher Findings

**Table 2:** Kolmogorov-Smirnov Test (Normality of Dependent Variable)

	Total returns from growth stocks	Returns from capital profit of growth stocks	Cash returns from growth stocks	Total returns of value stocks	Returns from capital profit of value stocks	Cash returns from value stocks	Expected returns of the implicit capital cost model
Numbers	190	190	190	190	190	190	190
Average	0.8576	0.0784	0.9359	2.5771	0.0663	2.6434	0.3916
Standard Deviation	1.91285	0.27335	1.98258	1.17954	0.26679	1.18218	2.07237
Absolute magnitude of maximum deviation	0.337	0.497	0.318	0.414	0.493	0.412	0.338
Positive maximum deviation	0.294	0.497	0.267	0.408	0.493	0.405	0.338
Negative maximum deviation	-0.327	-0.387	-0.318	-0.414	-0.402	-0.412	-0.333
Kolmogorov-Smirnov	1.507	1.251	1.389	1.500	1.593	1.673	1.243
Significance level	0.064	0.115	0.088	0.067	0.059	0.051	0.112

In Table 1, the average, which represents the equilibrium point and the distribution centre, and is a good indicator of the centrality of the data, is equal to 0.8576 for the total return of growth stocks. Median is another central indicator that shows that half of the data is less than this and the other half more than this value. Also, the uniformity of the average and median value indicates the normality of this variable, which is the total returns of the growth stocks, equals 0.19.

**Table 2:** Continue

	Expected returns from growth CAPM model	Expected returns from growth Carhart model	Growth real returns	Value real returns	Expected returns from value implicit capital cost	Expected returns from value CAPM model	Expected returns from value Carhart model
Numbers	190	190	190	190	190	190	190
Average	0.3916	1.2520	0.3519	0.4291	-1.0918	0.2584	1.2520
Standard Deviation	2.07237	2.38445	0.56541	0.59980	23.72500	0.46454	2.38445
Absolute magnitude of maximum deviation	0.238	0.294	0.130	0.082	0.412	0.141	0.294
Positive maximum deviation	0.338	0.294	0.130	0.082	0.299	0.141	0.294
Negative maximum deviation	-0.227	-0.072	-0.072	-0.053	-0.412	-0.096	-0.227
Kolmogorov-Smirnov	1.660	1.058	1.290	1.137	1.675	0.950	1.058
Significance level	0.054	0.231	0.103	0.151	0.050	0.251	0.231

Source: Researcher Findings

Scattering indicators are a measure of how much data are scattered from each other or scattered over the average. The standard deviation is one of the most important scattering indices, with the total returns of the growth stocks equal to 1.98585. The rate of asymmetry of the curve is called skewness. The value of the coefficient of skewness for the total return variables is positive and near zero, which indicates that the distribution is normal and skewness is very low to the right. The scattering index of the amount of stretch or bursts of the curve is called Kurtosis which in this study is positive for all variables; therefore, the variable of total returns from growth stocks has a normal distribution. In Table 2, since the significance level of all variables is greater than 5%, therefore, the assumption of zero, that is, the normality of the variables, is confirmed and a parametric method is used to test the hypotheses.

## 5.3 Analysis of Research Hypotheses

### 5.3.1 Test the First Hypothesis

Hypothesis 1: There is a significant difference between the average returns of total growth and values stocks.

The test results of this hypothesis are presented in Table 3.

**Table 3:** The Results from Equality Test of Ratios Average of the First Hypothesis

Significance level	t-statistics	Difference of average	Average of observations		Levine test		ratio	
			Value stocks	Growth stocks	Significance level	F-statistics	Equality of variances	Total returns from growth and value stocks
0.048	-1.983	-1.719	2.577	0.857	0.001	12.422	Equality of variances	Total returns from growth and value stocks
0.049	-1.983	-1.719					Inequality of variances	

Source: Researcher Findings

In Table 3, the significance level of the Levine test is less than 5%. Therefore, to conclude the hypothesis, the assumption of inequality of variances has been used. To test the significance of the difference between the average total returns of growth and value stocks, two different ratios have been used. As the significance level of t test is less than 0.05, this relationship is statistically significant. That is, the difference between the average returns of the total growth and value stocks are meaningful. Therefore, the zero assumption is rejected, meaning there is a significant difference between the average total returns of growth and values stocks.

**Table 4:** The Results from Equality Test of Ratios Average of the Second Hypothesis

Significance level	t-statistics	Difference of average	Average of observations		Levine test		ratio	
			Profit of value stocks	Profit of growth stocks	Significance level	F-statistics	Equality of variances	Total returns from growth and value stocks
0.693	0.395	-1.719	0.110	0.078	0.449	0.575	Equality of variances	Total returns from growth and value stocks
0.693	0.395	-1.719					Inequality of variances	

Source: Researcher Findings

### 5.3.2 Test the Second Hypothesis

Hypothesis 2: There is a significant difference between the average returns from capital profit of growth and stocks. The test results of this hypothesis are presented in Table 4. In Table 4, the level of significance of the Levine test is more than 5%; therefore, for the hypothesis conclusion, the assumption of the equality of variances has been used. To test the significance of the difference between the average returns from capital profit of the growth and value stocks, two different ratios have been used and since the significance level of the t test is greater than 0.05, this relationship is statistically significant.

cant, i.e., the difference between the average returns from capital profit of growth and value stocks is not significant. Therefore, the zero assumption is confirmed, that is, there is no significant difference between the average returns from capital profit of growth and value stocks.

### 5.3.3 Test the Third Hypothesis

Hypothesis 3: There is a significant difference between the average cash returns of growth and value stocks. The test results of this hypothesis are presented in Table 5.

**Table 5:** The Results from Equality Test of Ratios Average of Third Hypothesis

Significance level	t-statistics	Difference of average	Average of observations		Levine test		ratio	
			Cash returns of value stocks	Cash returns of growth stocks	Significance level	F-statistics	Equality of variances	Total returns from growth and value stocks
0.047	-1.994	-1.747	2.683	0.936	0.001	12.304	Equality of variances	Total returns from growth and value stocks
0.049	-1.979	-1.747					Inequality of variances	

Source: Researcher Findings

In Table 5, the significance level of the Levine test is less than 5%. Therefore, to conclude the hypothesis, the assumption of inequality of variances has been used. To test the significance of the difference between the average cash returns of growth and values stocks, two different ratios have been used. Since the significance level of t test is less than 0.05. Therefore, the relationship is statistically significant, that is, the difference between the average cash returns of growth and value stocks is meaningful. Therefore, the zero assumption is rejected; that is, there is a significant difference between the average cash returns of growth and value stocks.

### 5.3.4 Testing the Fourth Hypothesis

Fourth hypothesis: For growth stocks, the expected returns based on Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model. The test results of this hypothesis are presented in Table 6.

In Table 6, the significance level of the t-pair test for the expected returns on the basis of Carhart model for growth stocks is more than 0.05. Therefore, the above relation is not statistically significant, therefore the zero assumption for Carhart model is confirmed, that is, the average amount of estimated values is not significantly different from the actual values, and the significance level of the t-pair test for expected returns based on the capital asset pricing model for growth stocks is less than 0.05. Therefore, the relationship is statistically significant.

**Table 6:** Results of the t-Pairs Statistics of the Fourth Hypothesis

Significance level	Freedom degree	t- statics	Difference of pairs			ratio
			Deviation from average error	Deviation from error	average	
0.790	189	0.266	0.14097	2.05472	0.03968	Expected returns of Carhart model to real returns
0/000	189	5.649	0.15934	2.19636	0.90011	Expected returns of capital asset pricing model to real returns

Source: Researcher Findings

Therefore, the zero assumption for capital asset pricing model is rejected. So, the expected returns are closer to actual efficiency based on Carhart model. Therefore, the zero assumption is confirmed. In other words, for growth stocks, the expected returns based on Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model.

### 5.3.5. Test the Fifth Hypothesis

Fifth hypothesis: For stock values, the expected returns based on Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model. The test results of this hypothesis are presented in Table 7.

**Table 7:** Results of the t-Pair Statistics of the Fifth Hypothesis

Significance level	Freedom degree	t- statics	Difference of pairs			ratio
			Deviation from average error	Deviation from error	average	
0.000	189	-4.040	0.04472	0.61640	-0.18068	Expected returns of capital asset pricing model to real return
0.000	189	5.008	0.16233	2.23752	0.81295	Expected returns of Carhart model to real returns

Source: Researcher Findings

In Table 7, the significance level of t-paired test for expected returns based on capital asset pricing

model for value stocks is less than 0.05. Therefore, the relationship is statistically significant, so the zero assumption for capital asset pricing model is rejected; and the significance level of t-pair test for expected returns based on the Carhart model for value stocks is less than 0.05. Therefore, the relationship is statistically significant, so the zero assumption for the model of operations is rejected. Therefore, the average value of the estimated values with the actual values is significant, so the zero assumption is rejected. In other words, for value stocks, expected returns based on Carhart model are not closer to actual returns compared to expected returns based on the capital asset pricing model.

### 5.3.6 Sixth Hypothesis Test

The sixth hypothesis: For value stocks, the expected returns on the basis of Carhart model are closer to real returns compared to expected returns based on the implicit capital cost model. The test results of this hypothesis are presented in Table 8. In Table 8, the significant level of t-paired test for expected return based on the implicit capital cost model for value stocks is greater than 0.05. Therefore, this relation is not statistically significant, so the zero hypothesis is confirmed for the implicit capital cost model.

**Table 8:** Results of the t-Pair Statistic of the Sixth Hypothesis

Significance level	Freedom degree	t-statics	Difference of pairs			ratio
			Deviation from average error	Deviation from error	average	
0.532	189	-0.627	2.44292	33.67340	-1.53089	Expected returns of capital asset pricing model to real return
0.000	189	5.008	0.16233	2.23752	0.81295	Expected returns of Carhart model to real returns

Source: Researcher Findings

Therefore, the average value of the implicit capital cost estimates is significantly different from the actual values, and the t-pair test for the expected returns on the basis of Carhart model for stocks is less than 0.05. Therefore, the relationship is statistically significant and so, the zero assumption for Carhart model is rejected. Therefore, the expected returns are closer to actual return based on the implicit capital cost model. Therefore, the zero assumption is rejected. That is, for stock values, the expected returns based on Carhart model are not closer to actual returns than the expected return on the basis of the implicit capital cost model.

### 5.3.7 Test the Seventh Hypothesis

Seventh hypothesis: For growth stocks, the expected returns based on Carhart model are closer to

actual returns than expected on the basis of the implicit capital cost model. The test results of this hypothesis are presented in Table 9.

**Table 9:** Results of the t-Ppair Statistics of the Seventh Hypothesis

Significance level	Freedom degree	t- statics	Difference of pairs			ratio
			Deviation from average error	Deviation from error	average	
0.790	189	0.266	0.14907	2.05472	0.03968	Expected returns of capital asset pricing model to real return
0.000	189	3.664	2.06741	28.49724	7.57468	Expected returns of Carhart model to real returns

Source: Researcher Findings

In Table 9, the significant level of t-pair test for the expected returns of Carhart model for growth stocks is greater than 0.05. Therefore, the relationship is not statistically significant and the assumption zero is validated for Carhart model, that is, there is no significant difference between the average values of the estimated values and the actual values. Also, the significance level of the t-pair test for the expected returns of the implicit capital cost model for growth stocks is less than 0.55. Therefore, the relation is statistically significant and, the zero hypothesis is rejected for the implicit capital cost model and the expected returns are closer to the actual returns. Therefore, the zero assumption is confirmed; that is, for growth stocks, the expected returns on the basis of Carhart model are closer to real returns compared to the expected return on the basis of the implicit capital cost model.

## 6 Conclusion and Suggestions

The purpose of this study is to examine the expected returns based on Carhart model in comparison with the model of capital asset pricing and the implicit capital cost model based on cash returns and growth and value equity. The results of the study indicate that there is a significant difference between the mean total returns and returns from capital profit of growth and value stocks, while there is no significant difference between the average cash returns of growth and value stocks. In addition, for growth stocks, expected returns based on Carhart model are closer to real returns compared to expected returns based on the capital asset pricing model. Also, for value stocks, the expected returns on the basis of Carhart model are not closer to actual returns compared to expected returns based on the capital asset pricing model and the implicit capital cost. Finally, the results of the research showed that for growth stocks, the expected returns on the basis of Carhart model are closer to real returns compared to expected returns based on the model of implicit capital cost. In a study by [13], it has been found that, in line with poor economic conditions, price formation companies have less flexibility than growth companies, which low flexibility in price firms will increase their cost of capital which is to some extent consistent with the results of this study. Also, the results of [5] research



showed that increasing returns with increasing profitability for stock prices is more than growth stocks, which in this regard is not in line with the results of this study. Due to the non-alignment of some results with external researches, we can mention the lack of efficiency of Tehran Stock Exchange, the lack of proper information transparency, the choice of sample variety and the research period, and the different statistical techniques used. Similarly, [14] have shown that real returns are not an appropriate indicator for predicting expected returns, and predicted returns through the method of implicit capital cost compared with actual returns have a more meaningful relationship with the characteristics of the company, which is partly consistent with the results of this research.

According to the results of the first hypothesis, it is suggested that the Tehran Stock Exchange organizes training through media, holding classes, conferences, international conferences, publishing newspapers or magazines related to the analysis of stock companies, the creation of websites and information blogs and reducing the level of information and investor awareness of the return on total growth stocks and value and preventing huge losses of inexperienced investors, both institutional and individual. Based on the results of the second hypothesis, it is recommended that the preparation and development of the theoretical fundamentals of financial reporting and national accounting standards be considered. The results of this research and similar domestic investigations are considered, and stock brokers and financial advisers, whose task is to analyse the financial situation of the companies listed on the stock exchange and a description of the future financial status of companies for the purchase of stock companies, can consider the models and results of this research in the selection of investment portfolios.

Based on the results of the third hypothesis, it is appropriate that the Audit Organization and other regulatory and supervisory bodies, in developing accounting standards and financial regulations, pay more attention to the cash returns of the stock, and by providing the necessary guidelines, the users of the financial information in order to make optimal and informed decisions, they will help more than before. According to the results of the fourth hypothesis, it is suggested that this model be tested in a different way in the Tehran stock exchange considering the fact that the model of machines connects the fundamental economic concepts and the capital market. Based on the results of the fifth hypothesis, students, researchers and other enthusiasts can, by continuing such research, clarify the factors affecting the expected returns of firms. In addition, the requirement for companies to provide information in addition to current information is suggested as part of the asset pricing model. Regarding the results of the sixth hypothesis, it is recommended that analytical firms recommend rating companies in terms of expected returns, in order to increase transparency on the market, and investors in the capital market can make better decisions by relying on them.

According to the seventh hypothesis, considering different asset pricing models in risk prediction and stock returns is very important. The methods used by investors in risk forecasting and stock returns have been considered without considering these variables, and it is advised to use the model to predict the future returns of stocks, in this way, investors can better predict long-term expectations.

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