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Testing C-capm Model with D-capm Model in the Tehran Stock Exchange Return during the Last 8 Years

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Abstract: This study titled Testing Ccamp model with Dcamp model in the Tehran stock exchange return during the last 8 years, according to the importance of investment and financial decisions wants to test and investigate two above models among other models so that with the introduction of this model ,the investors have the possibility to better financial decisions and it would be a step to attract capital and investment in this big market. for this purpose after collecting theoretical data related to the theories, literature, the 152 sample from 250 was investigated and the financial data of recent 8 years from the official website of Tehran stock exchange was analyzed by Eviews software.in this study the ordinary least square method to estimate the c-capm and d-capm as used and the tests including Jarkko normality test, LM, ARCH, RAMSEY, the validity of the regression results was examined. Finally according to the resulted coefficient like the market return ,the consumption β coefficient, the reversed β coefficient and final coefficient in each model, the first two hypothesis was accepted and there is direct relation of β coefficient of each model in expected return and the other two hypnosis were rejected (the more efficiency of reversed β of d-camp model against the consumption β of c-capm mode and the more efficiency of d-capm against c-capm model in prediction of the expected return of Tehran stock exchange).the findings of the study show the more prediction power of C-capm model in comparison of the d-capm model during the last 8 years in Tehran stock exchange.

Keywords: C-capm, D-capm, Consumption β, Reversed β, Expected Return.

Introduction

Each of us in our lifetime will face many financial decisions that should choose one item from different investment options. In these cases, our choice depends heavily on the investment risk and return of that investment opportunities versus other opportunities .in fact the option should be selected as the investment opportunity that has the highest return by the same risk or has the lowest risk by the same return. Explaining the relationship between risk, return and pricing of capital assets, is a concept which has become the dominant paradigm of capital markets in recent decades. After expression of the capital asset pricing model by Sharp and Leitner in 1965, this model has been criticized and corrected several times. Many academic studies have recognized the beta factor as the stock return volatility measure and use the capital asset pricing model (capm) to measure the portfolio risk and estimate the expected return. During the past years the developed concept of semi variance the stock return negative beta (d-beta) as a substituted measure to measure the risk was introduced .there is other model for capital asset

pricing that considers the sensitivity of stock return change to consumption per capita change as a risk measure and known as the consumption based capital asset pricing model based on (c-capm).in this study , we want to examine the ability of these two new models in predicting the stock returns in Tehran stock exchange so that we could determine which method is more efficient in Tehran stock exchange and can better explain the relationship between the risk and return. Therefore, in this study we want to investigate this issue that among these two models for predicting the stock return, which one is more efficient in the stock exchange.

The literature review

During the twentieth century, the field of financial management was separated from the field of economics and with the grace of accounting evolved. Econometric modeling process were used in the financial field and besides the financial concepts, the scope of the discipline were extended. The Opposing theories in the field of financial market efficiency were raised and so scientists corrected their attitudes and thoughts. In 1973, Fischer, Black and Myron Scholes offered option pricing securities. this study showed that there is the liner relationship between risk and return.in CAOM model, the investor can get more return than the market return if he choose the stock with more market risk and the beta is more than one. But empirical research showed that this model, in which the expected return is affected by beta, can have little ability to explain the stock returns. These doubts led the effort to achieve a more efficient model (Tavangar & khosroyani, 2011). Lucas in 1978 for the first time introduced the consumption based capital asset pricing model. Lucas with considering the exchange economy by the homogeneous consumers examined the accident change of the capital return and presented the consumption based capital asset pricing model. He explained his model by the consumer agent whose utility function has the constant relative risk aversion coefficient. During these years a lot of researches have been conducted to compare the effectiveness and efficiency of different models with the traditional capm model but based on the researcher studies, there is no study to compare the c-capm and d-capm. Kocherlakota confirms that the c-capm due, integral role in modern macroeconomics and international economics, in reality, is more important than capm (Kocherlakota, 1996). Tavakkoli Baghdad abad (2005) in his study showed that the negative beta compared with beta provides the better estimate of the expected return rate and the D-CAPM model in comparison with C-CAPM provides better estimate of the expected return rate.

Theoretical foundations

The primary assumption in CAPM is that there is a linear relationship between stock returns and stock market returns over the course of time, so CAPM is formed based on the market risk and assumes that investors with accepting more risks expect more returns. Another assumption in explaining the CAPM is that ,the symmetric market conditions.it means that the conditions and factors related to the market are in the way that the investor gets the returns exactly according to the accepted risk and the feedback of this condition is reflected in his risk premium. but the studies show that when we see asymmetric market conditions, factors that affect the risk premium, also affects the expected rate of return on assets, therefore, eliminates the risk and return balance. The risk with lower return than expected returns that are used to assess investment returns logically, in the condition that the returns distribution is not normal has been proposed.

The introduction of the D-CAPM model

The downside capital asset pricing model is the verified model compared to the standard pricing model of capital assets and considers the lower and higher returns distribution from symmetry boundary. Also, he believed that the capital asset pricing model under asymmetric market provide the expected return estimate about 38% and D-CAPM provide the expected return estimate about 55% .although the semi variance measurement is useful and correct but the formula used to calculate the covariance (the reduction correlation) has the statistical mistake and doesn't show the real relationship between two assets. This measure doesn't consider the high return of one asset to cover the decreasing returns of other assets in the portfolio. Since the capital assets pricing model was formed based on the assumptions like each investor gets returns based on the accepted risk, it shows its use in the time symmetry market. So if the market conditions are changed and the investors couldn't get return based on the accepted risk and the risk premium is negative therefore the standard model can't be used for pricing (Fathi & Ahmadi Nia, 2012). The concept of negative risk is the most important factor for introducing the D-CAPM. In explaining this model we must refer to some of the financial assumptions. We know that the expected return of shareholder is formed from the divided profit and the stock price increase. Debt in the capital structure of an enterprise affects the created risk by stakeholders and in the absence of debt shareholders face only the commercial risk. So we can say that in this model the expected return is the sum of the risk-free rate of return, commercial risk premium and financial risk premium.

So to calculate the beta of this model the following formula will be used:

(1)

$$R_i = a_0 + a_1 B_{mi} + a_2 B_{ri} + e_i$$

(2)

$$\beta^D = \frac{\text{SemiCov}(r_i . r_m)}{\text{SemiVar}(r_m)}$$

The introduction of the C-CAPM

In The C-CAPM model risky assets create uncertainty in consumption. The main question in this model is whether an investor considers the costs associated with its investment according to the uncertainty in the market? (For example changes in earnings and asset values). This uncertainty caused by the difference in the decisions for investment in the risky asset. This model explains how much of the changes of the stock market returns associated with the consumption growth. The C-CAPM model is the basis for understanding the relationship between wealth, consumption and the risk aversion of investors. .To understands the consumption based capm model the consumption optimization problem should be considered. In each period, the person chooses one level of consumption, and also in each allocation period will have a different portfolio of various assets, and the ultimate aim is the maximizing the following utility function:

(3)

$$E_t \sum_{s=0}^{\infty} (1+\rho)^{-s} \mathrm{U}(C_{t+s})$$

E_t = Expected Conditional status from available information at the time

ρ =The subjective time preference rate

C_{t+s} = Consumption in t + s period

U = Strictly concave utility function of a period

Standard condition of the first order function is:

(4)

$$E_t\left[\left(\frac{1+R_{it}}{1+\rho}\right)\left(\frac{U^{/}(C_{t+1})}{U^{/}(C_t)}\right)\right] = 1$$

(5)

$$E_t[(1+R_{it})s_t] = 1$$

In which $R_{it}$is the return of the asset I and $S = \frac{U^{/}(C_{t+1})}{(1+\rho)(U^{/}(C_t))}$ is the marginal rate of substitution. Now we should find from equation (5) a relationship between the expected return of the assets and its covariance with consumption. The first point is that equation (5) according to the duplicate projection law in the unconditional expectations status is valid.so the equation (5) can be written as follows:

(6)

$$E[1+R_{it}] = [ES_t]^{-1}\left(1 - cov(R_{it}.S_t)\right)$$

Where E represents the expected non-conditional status and cov represents non-conditional covariance. We assume that the utility function of a consumer U (0) has the constant relative risk aversion, as follows:

(7)

$$U(C) = \frac{C^{1-A}}{1-A}$$

Where A is the measure of the relative risk aversion. With this utility function the Covariance of the function (6) can be estimated as follows:

(8)

$$COV(R_{it}, S_t) \cong \left[\frac{-A}{1+\rho}\right] . COV\left(R_{it}, \frac{C_{t+1}}{C_t}\right)$$

Now we can extract the consumption beta relationship. By combining equations (6) and approximation (8), we reach to the following equation:

(9)

$$R_i = a_0 + a_2 B_{ci} + U_i$$

The R (i) is the recognized return of the stock and other components are as follows (Goudarzi, 2008)

(10)

$$a_0 = [ES_t]^{-1} - 1$$

(11)

$$a_2 = \frac{Acov(R_{it}, C_{t+1/C_t})}{[(1+\rho)ES_t]}$$

(12)

$$\beta_{ci} = \frac{cov(R_{it}, C_{t+1/C_t})}{cov(R_{Mt}, C_{t+1/C_t})}$$

Materials and Methods

This research is an applied research because wants to apply the present theories in the financial management and wants to reach an efficient model for calculating and predicting the stock return. This research is mainly about the improvement of the knowledge related to the explanatory power of the c-capm model and d-capm model in the stock exchange listed companies and its findings are used to solve the related problems so this study is an applied study.in terms of the data gathering this study explains the present situation so it is explanatory-analytical study and it is post –event and causalresearch.in this study ,the beta of the c-camp ,d-camp are independent variables and the expected return from each theory are the dependant variables.

Conceptual definition of variables

The definition of return: is the reward that the investor acquires from his investment. In the certainty condition it is the decision criterion in evaluating projects in terms of their efficiency (Tehrani, 2010).

Risk definition: to define risk can be offered two perspectives:

First view: the risk is any possible fluctuations in economic return in the future.

The second view: risk is the possible negative fluctuations in future economic performance.

Risk-free rate of return: the return of risk-free assets and is shown by Rf and are available to everyone.

β: Beta is a measure of systematic risk securities as part of the total risk cannot be reduced or eliminated with diversification (Charles, 1943).

Operational definition of variables

The return definition:

Increase (decrease) in share prices + (-) dividends received = total return of any securities

The definition of risk: risk is the difference between the actual return and the return anticipated. To measure risk, we should measure distributions of returns for this we use the scale SD.

Returns with no risk: risk-free rate of return equals to the rate in Iran that can be propagated by the Central Bank's bonds.

β: a measure of the relative risk of a stock according to the market portfolio of all stocks (Charles, 1943).

Data collection method

In the collecting required data, this study based on the type of data, different types of resources are used. The data related to the stock return are collected from the notes of the companies audited financial statements and the data related to the stock price is collected from stock exchange annual reports in the official website of the stock exchange and also the Tadbir software is used and the data related to the theoretical discussions is collected from library resources. The sample of this study is the all manufacturing companies listed in the Tehran stock exchange during 2005 to 2012. In order to determine the sample first restrict the companies list by the following conditions and then by using the statistical formulas calculate the sample size.

The conditions that necessary that the companies in the sample have are the followings:

1.the acceptance of the companies in the Tehran stock exchange should be before 2005 (the beginning time period for the research) on the other words the companies in the sample should be the member of the Tehran stock exchange 2005 till 2012 (the end of the research time)

2. The stock of these companies has always been traded during the period of the study.

3. There would be access to the required data for conducting the research.

According to the above conditions 250 companies are identified.

Method for determining the sample size

Quantity part sample size: sample size is determined by the following formula:

$$n = \frac{Nt^2 p(1-p)}{Nd^2 + t^2 p(1-p)}$$

T= significance coefficient= (1.96)

D=the probability based accuracy in estimating the sample parameter= (0.08)

N=the size

P= the probability of the considered event = (0.5)

1-p=the probability of not occurring the event= (0.5)

Note: If the p-value is not available, it can be equal to 5.0, due to the fact that in this case the maximum amount of variance (0.25) is reached.

$$n = \frac{250*(1.96)^2*0.25}{250*(0.08)^2 + (1.96)^2*0.25} = 152$$

The Analysis of statistical data

In this study, to analyze the data correlation techniques will be used. Multiple regressions is the method to study the contribution of one or more independent variables in predicting the dependent variable. After analyzing data, the classic sale applied to the model to ensure the reliability and validity of variables. Classic sale includes:

- Test for normality Jarkko
- Variables unit root test
- LM test
- Arch Test
- Ramsey Test

Results

To evaluate the model Ccapm compared with Dcapm model for predicting the return of the Tehran Stock Exchange following hypotheses were considered:

The main hypothesis: the d-capm compared with the c-capm explains better the expected return on investment in the Tehran Stock Exchange.

The hypothesis 1: more higher the reverse market beta results the higher return in Tehran stock exchange.

The hypothesis 2: more higher the consumption beta results the higher return in Tehran stock exchange.

Hypothesis3: the inverse beta has more relationship with the return compared with the consumption beta.

In order to analyze the data and verify the hypothesis analytical methods and descriptive statistics were used. Data analysis was performed using Eviews software and the ordinary least squares method was used to estimate our model. For linear regression models, the simplest and most common method is the ordinary least squares method.

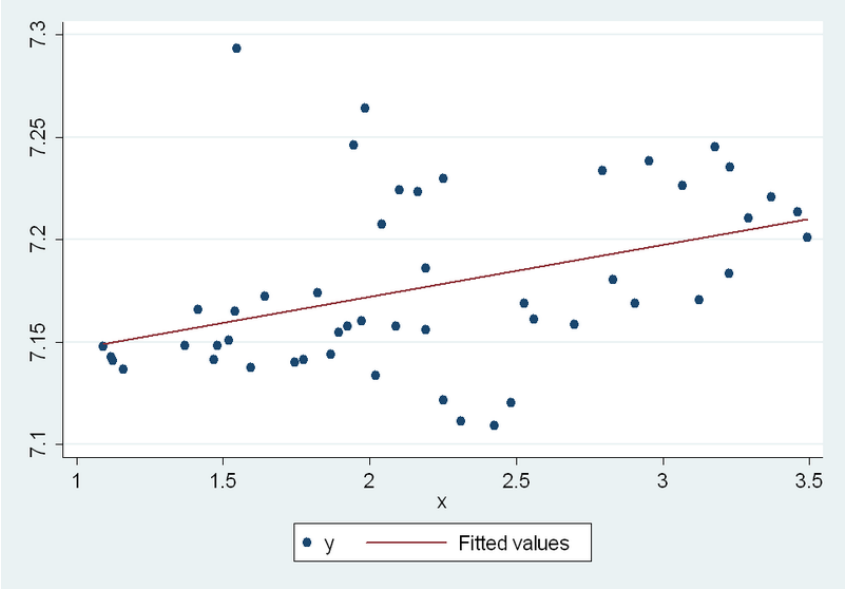

Figure 1. Ordinary least squares estimation model.

Table 1. CCAPM and DCAPM Models.

Equation	Model
$R_i = C(1) + C(2)*B_{mi} + C(3)*B_{ci} + [AR(1)=C(4), MA(1)=C(5)]$	CCAPM
$R_i = C(1) + C(2)*B_{mi} + C(3)*B_{ri} + [AR(2)=C(4), MA(1)=C(5)]$	DCAPM

Table 2. Variable unit root test.

Model	Variable	Prob	t-statistics
CCAPM	Ri	0.000	-4.25
	Bmi	0.000	-4.74
	Bci	0.000	-3.22
	Bri	0.000	-3.35
DCAPM	Ri	0.000	-3.15
	Bmi	0.000	-2.91
	Bci	0.000	-3.19
	Bri	0.000	-3.31

After verifying the model and doing the classic tests on model, now review we the results of the Hypothesis. According to Table 3 the results are presented in it the results of the above-mentioned Hypothesis as follows:

Table 3. The estimated coefficients for each model.

	Equation	Model
R^2=0.58	$R_i = 0.12 + 0.46*B_{mi} + 0.33*B_{ci} + [AR(1)=.87, MA(1)=0.54]$	CCAPM
R^2=51	$R_i = 0.08 + 0.43*B_{mi} + 0.25*B_{ri} + [AR(2)=0.98, MA(1)=0.71]$	DCAPM

The main hypothesis result: Given that the actual return factor in the DCAPM model was 0.43 and this factor is 0.46 in the CCAPM model so that it better reflects the predictive power of the model CCAPM model and the main hypothesis was rejected. The first hypothesis result: the coefficient obtained for reverse beta is 0.25, so we can conclude that this hypothesis is confirmed because the1 unit increase in reverse beta, yielding 0.25 increases in the return. The second hypothesis result: Given the fact that coefficient obtained for consumption beta is 0.33. The second hypothesis can be also confirmed. It means that with 1 unit increase in consumption beta, the return increases 0.33. The third hypothesis result: the hypothesis is about that the reverse beta has the higher predictive power compared with consumption beta .it could be concluded that the hypothesis is rejected because the consumption beta has the larger coefficient than the reverse beta and has the higher predictive power (0.33 > 0.25).

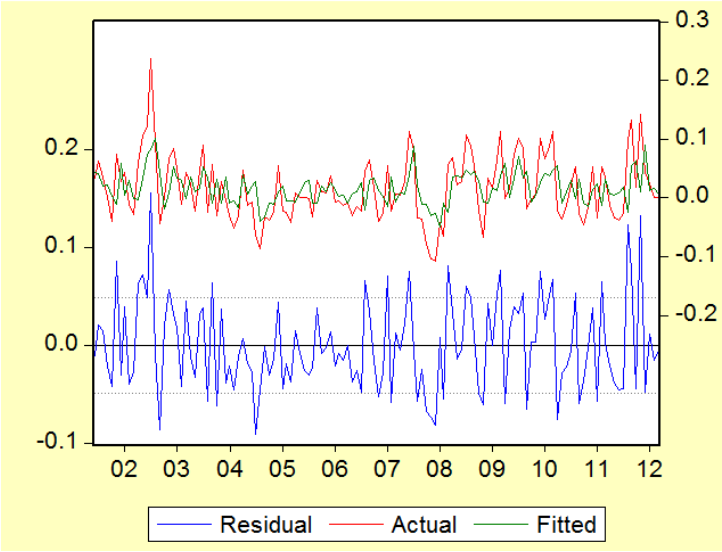

Figure 2. Stipulates graph of CCAPM model.

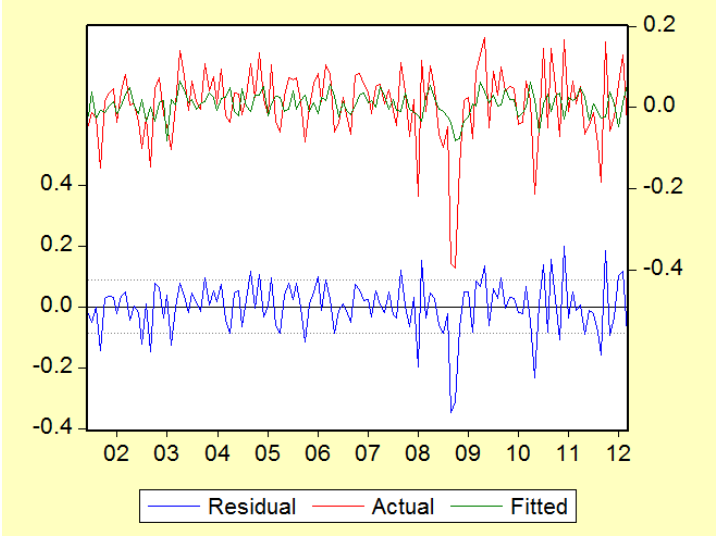

Figure 3. Stipulates graph of DCAPM model.

Discussion and conclusion

According to all the tests and the econometric procedures on these two models, the main hypothesis of this study is based on the D-CAPM model power compared with the C-CAPM in explaining the relationship between risk and return, rejected and state that the reversed beta doesn't replace the consumption beta, but it is weaker than the consumption beta. Also the consumption beta coefficient is bigger than inverse beta and it shows that the consumption beta is the appropriate measure for evaluating the risk. The prediction of stock returns by these two models and their comparison with real returns show that c-capm model has the better match between predicted values with real ones and better explain the relationship between risk and return compared with c-capm model.in other words, assuming other variables effected on the stock return change are constant, it could be said that c-capm is more efficient in Tehran stock exchange and provide better bases for making investment decision. But given the dynamics of the environment and all circumstances being changing , the realistic point is that the superiority of the C-CAPM model would be the reason to be comprehensive in the Tehran Stock Exchange in all times and as observed in this model, it covers only a small part of factors affecting the expected return .

In this study the focus was on all companies in the Tehran stock exchange and the more power of the c-capm model was achieved but perhaps due to the nature of different companies and industries, if the more detailed sample was studied different results could be achieved .so it could be concluded that each capital asset pricing model for especial industry works more efficient. Therefore it would be suggested that other researchers test these models in other industries with more detail. For other researchers it would be suggested that given the important factors considered in the model, they examine these models from other perspectives and test other hypothesis. Besides the two models that were examined in this study ,there are more new models in financial topics that conducting applied research for these models could help the financial markets of our country to be more efficient.

Conflict of interest

The authors declare no conflict of interest

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