



## A Study of the Effects of Leverages Ratio on Systematic Risk based on the Capital Asset Pricing Model Among Accepted Companies in Tehran Stock Market

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**ABSTRACT:** Systematic risk (Beta) is one of the most effective factors in predicting the appropriate required rate of return of portfolios. Understanding systematic risk of usual portfolio of various companies, investors consider financial investment more confidentially. The aim of this study is to determine if there is any significant relationship between Leverages ratio (Operating leverage, financial leverage, Compound Leverage) as independent variables and Systematic risk (Beta) as dependent variables. To do so 115 companies accepted in Tehran Stock Market were selected based on screening (systematic deletion) in an eight-year- period between "2005-2012". The required data were gathered from basic financial statement, committee reports, and other available documents in Tehran Stock Market. Regression and Pearson correlation were used to analyze the data. The results of the study revealed that there is not significant relationship between the variables. Some suggestions regarding the topic of the research are given too.

**Keywords:** Operating leverage, Financial leverage, Compound Leverage, Systematic risk (Beta)

ORIGINAL ARTICLE

### INTRODUCTION

Research funding sciences in our country takes the initial steps. Economic conditions and characteristics of traditional behaviors of investors and managers of business units have not yet provided the necessary fields of addressing the serious and coherent researches, especially determination price of stocks Located in an aura of ambiguity. The evidence shows, that investors do not used quantitative methods for determining price of stocks, but Judgments is based on subjective impressions and non-scientific information, to improve the conditions for development of capital market activities and to prevent failure, steps should be taken in order to have people participated in investment, such scientific results be replaced by subjective ideas and be trained how to utilize known methods, until both groups of managers and investors be able to sustain their presence in the capital markets with Selecting the correct ways and through Wheels of economy activities continue (Yousefi et al., 2009). The common stock, is such as those tools due to uncertain future returns, cause investors doubt, thus, if the conditions are provided for both investors and managers of companies, given awareness about the capital market, they will be familiar with all the effective factors of investment, consequently it will Help them on decision making and will be an effective factor to develop the capital market. Risk and return are two keys on types of investments, efficiency that an investor acquires is

not predictable, so s/he had to bear the risk, on the other hand on a rational investment, systematic risk are eliminated or reduced with a variety of investments and various industries. In fact amount of risk and return should be considered in an investment, the most challenging task of financial management is providing funds (Soltanpanah et al., 2007). Providing financial resources such as receiving loan and credit, is Required to pay principle amount at Due Date and Interest at sections of commitment, existence of financial fixed costs such as interest caused that power of nonprofit companies compared with these costs and Calculate the degree of leverage will be concerned by financial managers over the past. Leverages can be divided into two main categories, first operating leverage that the change percentage of the dependent variable (Operating profit) on the change percentage of the independent variable (Sales) will be measured by it. Second financial leverage refers to profit change of ordinary holders against fluctuations (EBIT). These changes are created by the publication Preferred stock and borrowing. [Of course there is the third group of leverage that shows the amount change of earning per share against a change percentage in sales, this leverage called compound leverage]. In other words, compound leverage is a combination of operating leverage and financial leverage that the relationship between profits of common stock and sale is considered. No evaluation

of investment projects cannot be carried out without knowledge of the minimum rate of return and the necessary risk for investment acceptance. However, any decision or change that occurs within the company, effect returns and risk of company's common stock, for example change in capital structure and use of cheap debt may be cause of reduced company's cost of capital. But on the other hand may Increase the financial risk (Soltanpanah et al., 2007). [Risk or uncertainty in the general sense refers to a result that is different with the expected result. Risk, is a deviation of actual return from the expected return, and systematic risk is degree of changes of return on an asset or special investment, than changes in return of set market investment. Stockholders prefer to invest in companies that have higher return, therefore in companies that have higher capital costs and higher systematic risk, investors will demand a higher rate of return]. CAPM model is expressed that the co-variance of stock returns with extra return of Market portfolio, are sufficient to explain extra return stocks (in a risk-free rate). According to the CAPM model, determinant factor to expected return is systematic risk (Jalilian, 2010a). This study focuses on the effects of Leverages ratio on systematic risk based on the capital asset pricing model among accepted companies in Tehran's Stock Market.

### **Expression Problem and importance of research**

Financial management field were separated from economic field during the twentieth century and evolved by using delicacies of the accounting field. Process of modeling that used in econometric came to the financial field and beside the financial concepts, amplify the scope of this field. Markovytz's research and his students Sharp and Mezansys in the field of portfolio management caused that would emerge first findings of the risk management. Also Sharp beside John Lintner and Jinn Masn founded CAPM theory (Tavangar et al., 2011). One of the important subjects in the field of financial management and investment is risk and its relationship with expected return. Due to the Special importance of this subject. Risk and expected return always has been on the spotlight by experts of the financial field, and because risk is one of the affecting factors on return of financial assets, Stockholders and investors need to measure the sensitivity to risk of stock and its financial assets and they are always looking to identify, measure and control the affecting factors on return of assets. CAPM model is trying to describe the relationship between risks and return of financial stocks and used to determine appropriate price of stocks (Ghanbari et al., 2009). Now that is going on four decades of life of the

model and according to field studies, this model is the most widely used model which is used in different fields now, financial management and investment such as estimating cost of capital stocks of the companies, performance evaluation of managed portfolio .... With the research conducted was determined that the CAPM risk is divided in two parts systematic risk and non- systematic risk. Systematic risk shows How to operate a stock in relation with the market of stock. In other words, the expected return of assets will depend on level of its systematic risk (beta) and non-systematic risk will depend on the specific circumstances of each share. Systemic risk is made up of two components: commercial and financial. Commercial risk will depend on two factors: 1) lack of confidence towards the company's sales, Means fluctuation of volume and price of sale and type of supplied goods for sale. 2) The degree of operational leverage: The role of this factor in creating this type of risk is important, operational leverage plays an important role in calculating earnings forecast before interest and taxes (EBIT) and calculating the company risk. So that if the degree of operational leverage is above the breakeven, the company's risk is high, and conversely, if the degree of operational leverage is under the breakeven, the company's risk is low.

Financial risk: This type of risk is a function of the methods of financing for the profit unit and refers to how the financial structure. This type of risk, financial leverage has an important role in calculating earnings before tax (EBIT) or earnings per share and the company's risk. Degree of financial leverage is a criterion to that is used to measure amount of debt of profit unit. Whatever amount of company's debt is greater; changes in earnings per share (EPS) will be greater for a certain amount of (EBIT). Finally, if the degree of financial leverage in a company be high, it means that the company's debt is high. However, there is another kind of leverage (compound) that encompasses the two types of risk (Jalilian, 2010b). Determining the Leverages ratio and systematic risk can pave the way for making decision in investment. Thus, the main purpose of this study is to identify a suitable criterion for determining the amount of return of investment and stock risk in accepted companies in Tehran stock markets. This research tries to explore the relation between Leverages ratio variable and systematic risk based on the Capital Asset Pricing Model. Furthermore the study tries to disclose this idea whether the information about Leverage ratio can be considered as a criterion for assessing the amount of systematic risk in accepted companies in Tehran stock markets. According to Capital Asset Pricing Model CAPM, beta is the mere determining

factor for the rate of return of investment. Hence, understanding the relation among between Leverages ratio (Operating leverage, financial leverage, compound Leverage) with systematic risk can help investors and stock market brokers to determine the risk of companies' stocks.

**The main research question is as follows:**

Is there a significant relationship between Leverages ratio and systematic risk based on the capital asset pricing model among accepted companies in Tehran stock markets?

The effect of these factors and proving the relationship among them can help investors to tolerate less risk. Availability of sufficient information about Leverages ratio and beta factor and ease of calculation encourage researchers to do more research in these areas. The outcome of this very study can help researchers theoretically and practically. The results of this study can help investor to decide more wisely in investing their capitals in Tehran stock markets.

**Literature Review**

AmirHosseini et al. (2010), paid to the test of power of explanation Conditional downside capital asset pricing model (CD-CAPM) in order to predict the risk and the expected rate of return in Tehran Stock Exchange. The results showed that Model's power of explanation (CD-CAPM) and (D-CAPM) have a Significant difference with spend positive risk in Tehran Stock Exchange and the model of (CD-CAPM)with spend positive risk has a higher power of explain than (D-CAPM). Also, There is a significant difference between (CAPM) and (CD-CAPM) with spend positive risk Tehran Stock Exchange and the model of (CD-CAPM) with spend positive risk has a higher power of explains than (CAPM).

Darabi et al. (2009), paid to evaluate the relationship between operating leverage and systematic risk. The results showed, there is a significant relationship between the operational leverage and systematic risk, but there is no significant relationship between the operational leverage and efficiency.

Tehrani et al. (2008) paid to investigate the relationship between risk and return based on CAPM and comparison with the C-CAPM. The results showed, despite in the theory, consumption beta should be a better measure of systematic risk, but the experimental performance of the traditional pricing model shows more success.

Khoshkar Hassan Kyadeh (2008) paid to investigate the relationship between financial and operating leverages with systematic risk (beta) in companies that have been accepted in Tehran Stock Exchange. The

results showed that the systematic risk has had most affected of degree of financial leverage. Also, there is a significant relationship between company Size and systematic risk.

Sabaghian Kakhki (2006) paid to investigate the relationship between financial variables and systematic risk of common stock in companies that have been accepted in Tehran Stock Exchange. The results indicate that the relation between financial leverage, the degree of financial leverage, operating leverage, the degree of operating leverage, current ratio, quick ratio, net profit to sales ratio, return on net worth, total assets, sale of company and type of industry with Beta, and the model can explain about 62 percent of beta change.

Sinai et al. (2004) paid to investigate the relationship between financial leverage and systematic risk of common stock of Joint stock Public companies in Iran. Results showed no significant variation in systematic risk of companies, after the increase in debt than before the increase in debt.

Zaryffard et al. (2003) paid to the experimental test of the CAPM model and the relationship between risk and return. Results showed that the systematic risk alone cannot justify changes in companies return.

Qalibaf (1994) paid to investigate, influence of capital structure (financial leverage) on systematic risk (Beta) in companies that have been accepted in Tehran Stock Exchange. Results showed that the mean of non-leverage Beta is smaller than mean of leverage Beta.

Lynch et al. (2003) confirmed the importance of multi-scale framework on analysis of price changes, with the combination daily data weekly and monthly, results showed that the beta is sensitive to the time interval, so that, multi-scale approach is presented to explain the results more appropriate

Gençay et al. (2003) by using wavelet analysis paid to investigate the relationship between stock returns and systematic risk in a different time scale in America Exchange. Results showed that the relationship between stock returns and beta will be stronger with the increasing scale. Therefore, the CAPM model forecast is more appropriate in medium term and long-term horizons

**Research questions and hypotheses**

The aim of the present study is to investigate any significant relationship between Leverage ratios (Operating leverage, financial leverage, Compound Leverage) as an independent variable and systematic risk of usual portfolio as a dependent variable. The study includes one main hypothesis and three minor hypotheses. If necessary the impact of research variables in two forms will be investigated. In the first

case inflation index and wholesale price index and adjustment services will be considered while in the second case service adjustment will not be included in the study.

**The main hypothesis** states that there is a significant relationship between Leverage ratio and systematic risk based on the capital asset pricing model.

The other research hypotheses are as follows

1. There is a significant relationship between Operating leverage and systematic risk based on the capital asset pricing model.
2. There is a significant relationship between financial leverage and systematic risk based on the capital asset pricing model.
3. There is a significant relationship between Compound Leverage and systematic risk based on the capital asset pricing model.

## MATERIALS AND METHODS

This research is an applied research. According to the types of variables the research is descriptive in which the relationship among variables will be explored using regression and correlation coefficient equations. Research procedure includes all accepted companies in Tehran stock markets. The related review of research literature will be gathered through books and related ISC& ISI journals and internet (library search). The related data for testing the hypothesis will be collected from Tehran stock markets, annual data sheets, explanatory remarks of accepted companies in Tehran stock markets (including data sheet, benefit and lost) board of managers' reports and software showing financial information of companies. The study covers the period of eight years. The collected data from Tehran stock market will be saved in databank software such as Excel (field study). Pearson correlation will be used to find any relationship among the variables. Moreover to assess the impact of each variable on dependent variable step wise regression analysis will be applied. The least square with confidence level of 0.095,  $R^2$  coefficient, normalized  $\bar{R}^2$  and P size is used. If  $P\text{-value} < 0.05$ , then directional hypothesis approved otherwise the null hypothesis is approved. SPSS and Excel software's will be applied for presenting statistical graphs, tables, modeling and analysis of data. The statistical sample of this study will include all companies accepted in Tehran stock markets. Sample size will be selected according to the four following criteria and systematic deletion rule based on screening financial lists:

1. The financial lists data will be available for the period of eight years (2005-2012).

2. The financial year for each 12 months period had been determined.

3. The under study companies be active at least for the last six months.

4. The under study companies are not investment companies.

Note: brokers and investing companies will not be considered in this study.

## RESULTS

\*There is a significant relationship between Operating leverage and systematic risk based on the capital asset pricing model.

Results of testing first hypothesis that are calculated by three measures presented in research: Whole sale price index of goods and services, without adjustment and inflation rate, indicates that according to significant level of 0.441, 0.438 and 0.451 and acceptable error level (0.05) and confidence level of 0.095, don't have a meaningful relationship together. In other words  $H_0$  hypothesis is acceptable. This hypothesis expresses that there is not meaningful relationship.

There is a significant relationship between financial leverage and systematic risk based on the capital asset pricing model. Results of testing Third hypothesis that are calculated by three measures presented in research: Whole sale price index of goods and services, without adjustment and inflation rate, indicates that according to significant level of 0.555, 0.559 and 0.570 and acceptable error level (0.05) and confidence level of 0.095, don't have a meaningful relationship together. In other words  $H_0$  hypothesis is acceptable. This hypothesis expresses that there is not meaningful relationship.

There is a significant relationship between Compound Leverage and systematic risk based on the capital asset pricing model. Results of testing Third hypothesis that are calculated by three measures presented in research: Whole sale price index of goods and services, without adjustment and inflation rate, indicates that according to significant level of 0.358, 0.367 and 0.372 and acceptable error level (0.05) and confidence level of 0.095, don't have a meaningful relationship together. In other words  $H_0$  hypothesis is acceptable. This hypothesis expresses that there is not meaningful relationship.

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\* Due to in the linear regression, there is no significant relationship between leverage ratio and systemic risk and As regards, it was not any variable that enters to equation (No correlation between variables), so, stepwise regression is not performed.

**Table 1.** Theoretical & Operational Definition of Project variables

variable	Variable Type	Theoretical Definition	Operational Definition
<b>Operating leverage</b>	Independent	It shows percentage change in earnings before interest and taxes against one percent change in sales.	$OL = \frac{Q(P-V)}{Q(P-V)-F}$
<b>financial leverage</b>	Independent	It shows, percentage change in earnings per share against one percent Change in earnings before interest and taxes	$FL = \frac{S-F-VC}{S-F-VC-I-\frac{E}{1-t}}$
<b>Compound Leverage</b>	Independent	It shows the rate of change in earnings per share against a percent change in sales.	$FL = \frac{S-VC}{S-F-VC-I-\frac{E}{1-t}}$
<b>Systematic Risk (Beta)</b>	Dependent	Also called un diversifiable risk or market risk. A good example of a systematic risk is market risk. The degree to which the stock moves with the overall market is called the systematic risk and denoted as beta. Systematic risk, also called market risk, is risk that's characteristic of an entire market, a specific asset class, or a portfolio invested in that asset class.	$\beta = \frac{Cov(R_i, R_m)}{Var(R_m)}$

**Table 2.** Data calculations of hypotheses

Type of adjustments	hypothetical	Coefficient of	Type of Relationship	Std. Error	N	R	R <sup>2</sup>	P-value	Confidence Interval	Hypothesis Verification
<b>Whole sale price index</b>	1	Pearson	Linear	0.05	115	-0.022	0.0005	0.441	0.095	H0
	2	Pearson	Linear	0.05	115	0.018	0.0003	0.555	0.095	H0
	3	Pearson	Linear	0.05	115	0.035	0.001	0.358	0.095	H0
<b>No adjustment</b>	1	Pearson	Linear	0.05	115	-0.021	0.0004	0.438	0.095	H0
	2	Pearson	Linear	0.05	115	0.017	0.0003	0.559	0.095	H0
	3	Pearson	Linear	0.05	115	0.034	0.001	0.367	0.095	H0
<b>Adjusting for inflation</b>	1	Pearson	Linear	0.05	115	-0.020	0.0004	0.451	0.095	H0
	2	Pearson	Linear	0.05	115	0.016	0.0003	0.570	0.095	H0
	3	Pearson	Linear	0.05	115	0.033	0.001	0.372	0.095	H0

**DISCUSSION**

The value of any research is the results that it has provided. The aim of this study was to investigate the Leverage ratio and systemic risk based on Capital Asset Pricing Model (CAPM) in Tehran Stock Exchange. The effect of ratios such as, leverage on systematic risk ratio and prove the relationship between these two factors can help investors to be endured fewer risks. Availability of adequate information about the leverage ratio and the beta factor, and the convenience and simplicity of their calculation is another thing that encourages scholars and researchers to have more study in this field of research. However the final results of research indicates that no significant relationship between related variables. But should be reminded that in the real world, a phenomenon may be affected by numerous factors and variables. Some groups of this factors and variables have been identified for research and somewhat s/he can determine effect of these factors on the phenomenon. There are other factors that or researcher is unaware of their existence or it is not possible determine their quantitatively impact on the dependent variable studied. Therefore, researcher

can be investigated a limited number of independent variables in each research. Also in present study, other factors such as relationship between capital structure (with emphasis on criteria for determining of financial leverage) and... Are effective in company stock returns that the researcher has not been investigated them. So considering the cases mentioned in the text can be offered considerable practical suggestions related to the subjects which include:

1. Considering the importance of systemic risk in investment decisions Investors, creditors and stock market participants recommended, when trading stocks, and achieve greater return, should consider systematic risk (beta) with regard to the results of this study and similar studies.
2. Considering the importance of systematic risk estimates can be investigated the relationship of other indices and accounting and financial variables (Such as indicators of activity) and type of Industry with systemic risk.
3. In the similar studies this study can be done as a laboratory, by using user's views of financial statements, to this form that by giving information of companies and their financial statement to two

groups, be study which group will do a better choice and be a better decision.

4. The importance and usefulness of companies accounting information in determining their asset risk and stock returns makes required that companies listed in stock for better, put on internet sites information of financial statements of various periods, until be facilitated public access to it, this information can be very useful in predicting stock returns and risk.

5. In the present study linear regression method has been used to predict relationship of variables, It is recommended that in future studies non-linear equations method Be used, quadratic equations, logarithmic and ... Because lack of relationship or weak correlation in the linear method, is not reason to lack of correlation or lack of strong relationship between variables.

6. Investigate role of Capital Asset Pricing Model in capital budgeting can be considered in future studies

7. This study will test in other markets except Tehran Stock Exchange and its results will be compared with the results of this study.

8. Present study can be repeated as a case study or for active companies at a particular industry and its results will be compared with the results of this study.

9. Present study can be performed as a comparison between stock market two or more countries and its results will be compared with the results of this study.

10. In future studies, for more reliable results, do a study in longer time period for example 10 years.

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