

## A survey of the relationship between the financial leverage of companies listed in Tehran Security Exchange (TSE) and systematic risk

Albert Boghosian<sup>1</sup>, Mohsen Zarandi Moghadam<sup>2</sup>

<sup>1</sup>PhD in Economics, Assistant Professor, University of Tehran, Kish International Campus, Kish, Iran

<sup>2</sup>Msc in Financial Management, University of Tehran, Kish International Campus, Kish, Iran

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### ABSTRACT

One of the most important issues of the companies having the growth stage of their life cycle is financing methods and the methods are influenced by the decisions taken and the rules from the decision making institutions as central bank and TSE and change the behavior of the companies in development process. How is the influencing and affection direction in this interaction and how are the significant relations being defined in this interaction and what is the recognition of such relations in applying the effective policies in enterprise development process. All the above items are main issue of the current study. The specific importance of the current study is such that the relationship between the systematic risk and financial leverage is analyzed. The current study is applied one in terms of aim. The time scope of the current study is consisting of 5 years from 50 companies listed in TSE with available information. Randomly, 50 companies were selected that at least they were listed in TSE since 2004 and applied debt in their financial structure, they were not investment companies and their fiscal year end was Esfand and the financial data of the companies during 2006 to 2010 were the basis of the analysis of research variables. The identification of the linear positive relationship between the financial leverage and systematic risk: Based on the results of regression test, the linear relationship between the two variables is rejected. Based on the result of Wilcoxon test and mean comparison test of the population, the inequality of the mean of systematic risk before and after the increase of debt at error level 5% is rejected. It means that there is no significant difference between the systematic risk ( $\beta$ ) of common stock of the companies before and after the increase of debt.

**KEYWORDS:** Financial leverage; Stock; Systematic risk; Iran

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### INTRODUCTION

One of the most important issues of the companies having the growth stage of their life cycle is financing methods and the methods are influenced by the decisions taken and the rules from the decision making institutions as central bank and TSE and change the behavior of the companies in development process. Financing methods besides affecting the financial structure and companies ownership structure, they can be in interaction with the macro economical indicators such as economical growth indicators and micro indicators as enterprise risk. How is the affecting and influence directions in the interaction and how the significant relations are defined in this interaction and what is the necessity of the recognition of such relations in applying the effective policies in enterprise development process.

If a specific form of financial structure affects the economical growth or enterprise indicators, the economical policy makers should consider this issue in their decisions (Taqavi and Ahadi, 2007).

A financial manager in financing not only considers financial resources but also the company risk and its effect on common stock risk of the company in TSE to determine the optimized amount of debt to capital increasing the value of the company and the wealth of the stock holders (Mosavi and Keshavarz, 2010).

The company with no debt is a company with a complete capital structure but really we don't know anything about such company and all the companies applied various ratios of leverage. Thus, by the amount of the debt, some changes are made in the company risk and its stock for the purchasers (Sinayi and Khoram, 2004).

To achieve the knowledge that there is an association between the capital structure and common stock risk in stock market, the current study aimed to find a significant association between the capital structure of the company and systematic risk ( $\beta$ ) of common stock in stock market that the investors use its results in their decision making and the companies in their financing decisions to optimize the decisions. The significance of the study is such that the

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\*Corresponding Author: Albert Boghosian, PhD in Economics, Assistant Professor, University of Tehran, Kish International Campus, Kish, Iran

relationship between the systematic risk and financial leverage is analyzed. If we prove the relationship between the two variables, we can say that at least our market was efficient in relation with the existing variables in the theory.

**Research purpose**

- 1- The study of the positive linear relationship between the financial leverage and systematic risk
- 2- The study of the significant difference between the systematic risk of common stock of the companies before and after the increase of the debt.

**Hypotheses**

To achieve the main purposes in the study, 2 main hypotheses are tested:

- There is a linear positive association between the financial leverage and systematic risk.
- There is a significant difference between the systematic risk ( $\beta$ ) of the common stock of the companies before and after the increase of the debt.

**Study method**

The current study is applied one in terms of aim relate to the issues of financing structure and the systematic risk. The time scope of the current study is consisting of 5 years from 50 companies listed in TSE with available information. Randomly, 50 companies were selected that at least they were listed in TSE since 2004 and applied debt in their financial structure, they were not investment companies and their fiscal year end was Esfand and the financial data of the companies during 2006 to 2010 were the basis of the analysis of research variables.

In the study, the financial data of 50 companies of general partnership listed in TSE with definite tax condition were selected. Now, by the calculation of the systematic risk and financial leverage investigated the relationship between the two main variables. The systematic risk is obtained of the division of stock return covariance and market return by the return variance of the market portfolio. According to the previous studies, it is consistent with the beta obtained empirically from the regression analysis method.

To calculate the financial leverage, the total debts of company i in year t is divided by total assets of company i in year t and the relation of two variables is obtained by the regression. It can be said that the required data for the study was during 5-year 2006 to 2010 and Rahavard Novin software was extracted.

**- The model of determining the systematic risk of common stock ( $\beta$ )**

The model is estimated by Ordinary Least Squares (OLS). Thus, OLS is estimated of Beta as the following:

$$\beta = \frac{Cov(R_{it}, R_{mt})}{\sigma(R_{mt})}$$

Where,

$R_{it}$ : The stock return rate during period t

$R_{mt}$ : The market return rate during period t

Krischenheiter and Jorgensen (2003) found that the beta obtained of the division of the covariance of stock return and market return by the variance of market portfolio return is consistent with the bet obtained empirically by regression method. Thus, in this study, the systematic risk variable (Beta) by the estimation is calculated.

**- Financial leverage model**

To calculate the financial leverage of the companies, the following formula is used:

$$FL_{it} = \frac{TD_{it}}{TA_{it}}$$

$TD_{it}$ : Total debts of company i in year t

$TA_{it}$ : Total asset of the company in year t

**RESULTS**

**Statistical analysis of financial leverage**

As is shown in the Table, 50 companies are active in the form of six various groups. Despite the increase of the asset of some of the companies such as Bime Parsian in 2010, the leverage decrease is occurred in them and it means that debt share is subtracted of total asset and the debt ratio of the company is decreased and total new assets are not financed by the debt. Even in other companies, the leverage increase percent is less than the percent of the

increase of total asset. Also, if the increase of leverage is less than the increasing percent of the asset, it means that some of the asset increase is not from the debt.

**Table 1: The asset of the end period and financial leverage of the study sample companies (asset based on Million RIs)**

| No. | Company                     | Activity                      | 2006     |          | 2007     |          | 2008     |          | 2009     |          | 2010     |          |
|-----|-----------------------------|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
|     |                             |                               | Asset    | Leverage | Asset    | Leverage | Asset    | Leverage | Asset    | Leverage | Asset    | Leverage |
| 1   | Magsal                      | Agriculture and food          | 12500    | 0.64     | 12500    | 0.64     | 12900    | 0.65     | 13600    | 0.81     | 13700    | 0.82     |
| 2   | Kalber dairies              | Agriculture and food          | 12500    | 0.64     | 12500    | 0.64     | 2500     | 0.64     | 3400     | 0.73     | 3400     | 0.73     |
| 3   | Pars vegetable oil          | Agriculture and food          | 154200   | 0.98     | 156000   | 0.97     | 161000   | 0.98     | 161000   | 0.98     | 161000   | 0.98     |
| 4   | Shokopars                   | Agriculture and food          | 36000    | 0.83     | 38000    | 0.84     | 38000    | 0.84     | 42000    | 0.86     | 42000    | 0.86     |
| 5   | Mahram                      | Agriculture and food          | 35000    | 0.91     | 36000    | 0.85     | 36000    | 0.85     | 36000    | 0.85     | 37000    | 0.86     |
| 6   | Margarine                   | Agriculture and food          | 120000   | 0.97     | 110271   | 0.95     | 110271   | 0.95     | 110271   | 0.95     | 113871   | 0.96     |
| 7   | Bime Dana                   | Insurance                     | 105475   | 0.97     | 110271   | 0.95     | 110271   | 0.95     | 110271   | 0.95     | 113871   | 0.96     |
| 8   | Bime Asia                   | Insurance                     | 455000   | 0.91     | 469000   | 0.93     | 469000   | 0.93     | 469000   | 0.93     | 469000   | 0.93     |
| 9   | Bime Parsian                | Insurance                     | 1100000  | 0.73     | 1300000  | 0.76     | 1340000  | 0.77     | 1380000  | 0.79     | 1410000  | 0.76     |
| 10  | Bime Dey                    | Insurance                     | 305361   | 0.55     | 305361   | 0.55     | 305361   | 0.55     | 305361   | 0.55     | 396241   | 0.64     |
| 11  | Bime Alborz                 | Insurance                     | 260000   | 0.83     | 270000   | 0.56     | 270000   | 0.56     | 270000   | 0.56     | 302000   | 0.59     |
| 12  | Information services        | Communication and information | 250000   | 0.61     | 250000   | 0.61     | 250000   | 0.61     | 324119   | 0.72     | 400000   | 0.75     |
| 13  | Iran mobile communication   | Communication and information | 2064000  | 0.76     | 2100000  | 0.79     | 2100000  | 0.79     | 2100000  | 0.79     | 2310000  | 0.83     |
| 14  | Parsian electronic commerce | Communication and information | 206000   | 0.67     | 206000   | 0.67     | 206000   | 0.67     | 304000   | 0.73     | 391000   | 0.81     |
| 15  | Iran telecommunication      | Communication and information | 36967160 | 0.15     | 36967160 | 0.15     | 40000000 | 0.17     | 51000000 | 0.19     | 51000000 | 0.19     |
| 16  | Iran Arqam                  | Communication and information | 50000    | 0.44     | 70000    | 0.48     | 110000   | 0.57     | 110000   | 0.57     | 110000   | 0.57     |
| 17  | Aboreihan pharmacy          | Pharmacy                      | 30000    | 0.67     | 30000    | 0.67     | 30000    | 0.67     | 40000    | 0.79     | 450000   | 0.78     |
| 18  | Dr. Abidi Pharmacy          | Pharmacy                      | 46000    | 0.63     | 54000    | 0.64     | 63000    | 0.65     | 63000    | 0.65     | 63000    | 0.65     |
| 19  | Pharaby pharmacy            | Pharmacy                      | 100000   | 0.64     | 140000   | 0.75     | 145000   | 0.76     | 145000   | 0.76     | 148000   | 0.74     |
| 20  | Amin pharmacy               | Pharmacy                      | 50000    | 0.54     | 67000    | 0.55     | 78000    | 0.57     | 86000    | 0.58     | 86000    | 0.58     |
| 21  | Osveh pharmacy              | Pharmacy                      | 36000    | 0.60     | 36000    | 0.60     | 42000    | 0.62     | 42000    | 0.62     | 42000    | 0.62     |
| 22  | Kosar pharmacy              | Pharmacy                      | 90000    | 0.57     | 110000   | 0.61     | 120000   | 0.62     | 120000   | 0.62     | 120000   | 0.62     |
| 23  | Lizing Sanat O madan        | Lising services               | 400000   | 0.80     | 400000   | 0.80     | 400000   | 0.80     | 450000   | 0.83     | 470000   | 0.83     |
| 24  | Lising Rayan Saypa          | Lising services               | 300000   | 0.84     | 450000   | 0.87     | 450000   | 0.87     | 470000   | 0.88     | 470000   | 0.88     |
| 25  | Lizing kHodro Qadir         | Lising services               | 300000   | 0.73     | 300000   | 0.73     | 300000   | 0.73     | 300000   | 0.73     | 320000   | 0.74     |
| 26  | Iran lizing                 | Lising services               | 300000   | 0.79     | 340000   | 0.81     | 340000   | 0.81     | 380000   | 0.83     | 410000   | 0.84     |
| 27  | Lizing Iranian              | Lising services               | 1000000  | 0.74     | 1000000  | 0.78     | 1200000  | 0.83     | 1200000  | 0.83     | 1200000  | 0.83     |
| 28  | Mashine sasi arak           | Industrial and mineral        | 540000   | 0.90     | 540000   | 0.87     | 560000   | 0.91     | 560000   | 0.91     | 560000   | 0.91     |
| 29  | Shishe Hamedan              | Industrial and mineral        | 45000    | 0.53     | 45000    | 0.53     | 56000    | 0.67     | 62000    | 0.69     | 62000    | 0.69     |
| 30  | Mes Bahonar                 | Industrial and mineral        | 225000   | 0.81     | 225000   | 0.81     | 225000   | 0.81     | 225000   | 0.81     | 340000   | 0.91     |
| 31  | Petrochimi Abadan           | Industrial and mineral        | 160000   | 0.68     | 230000   | 0.73     | 300000   | 0.81     | 300000   | 0.81     | 300000   | 0.81     |
| 32  | Golgohar                    | Industrial and mineral        | 440000   | 0.35     | 440000   | 0.35     | 440000   | 0.35     | 470000   | 0.39     | 470000   | 0.39     |
| 33  | Foulad Aliaji Yazd          | Industrial and mineral        | 40000    | 0.48     | 40000    | 0.50     | 60000    | 0.61     | 74004    | 0.63     | 74004    | 0.63     |
| 34  | Parskhazar                  | Industrial and mineral        | 100800   | 0.64     | 100800   | 0.65     | 100800   | 0.65     | 120805   | 0.74     | 120805   | 0.78     |
| 35  | Palayesh Naft Isfahan       | Industrial and mineral        | 4162258  | 0.53     | 4162258  | 0.53     | 4162258  | 0.53     | 5000000  | 0.64     | 5000000  | 0.64     |
| 36  | Palayesh Naft Tabriz        | Industrial and mineral        | 1942105  | 0.65     | 1942105  | 0.65     | 2136876  | 0.73     | 2136876  | 0.73     | 2136876  | 0.73     |
| 37  | Mehvar Khodro               | Industrial and mineral        | 300000   | 0.67     | 310000   | 0.68     | 310000   | 0.68     | 310000   | 0.68     | 310000   | 0.68     |
| 38  | Tamir Mashine               | Industrial and mineral        | 20000    | 0.50     | 28000    | 0.62     | 34000    | 0.65     | 34000    | 0.65     | 37000    | 0.66     |
| 39  | Ring Mashhad                | Industrial and mineral        | 104075   | 0.74     | 104075   | 0.74     | 110000   | 0.76     | 135000   | 0.76     | 146000   | 0.81     |
| 40  | Electrik khodro             | Industrial and                | 105000   | 0.71     | 120000   | 0.72     | 135000   | 0.76     | 135000   | 0.76     | 146000   | 0.81     |

|    |               |                        |         |      |         |      |         |      |         |      |         |       |
|----|---------------|------------------------|---------|------|---------|------|---------|------|---------|------|---------|-------|
|    | Sharq         | mineral                |         |      |         |      |         |      |         |      |         |       |
| 41 | parskhodro    | Industrial and mineral | 1200000 | 0.73 | 1500000 | 0.75 | 1500000 | 0.75 | 1500000 | 0.75 | 1500000 | 0.80  |
| 42 | Kashi Isfahan | Industrial and mineral | 150000  | 0.70 | 150000  | 0.71 | 200000  | 0.73 | 200000  | 0.73 | 200000  | 0.73  |
| 43 | Kashi Alvand  | Industrial and mineral | 250000  | 0.53 | 250000  | 0.53 | 314000  | 0.55 | 314000  | 0.72 | 314000  | 0.72  |
| 44 | Kashi Sina    | Industrial and mineral | 121500  | 0.46 | 121500  | 0.46 | 121500  | 0.48 | 121500  | 0.51 | 121500  | 00.51 |
| 45 | Kashi Hafez   | Industrial and mineral | 60000   | 0.61 | 72000   | 0.63 | 88000   | 1.68 | 88000   | 1.68 | 88000   | 1.68  |
| 46 | Siman sofian  | Industrial and mineral | 250000  | 0.70 | 250000  | 0.70 | 250000  | 0.70 | 250000  | 0.70 | 320000  | 0.76  |
| 47 | Siman Tehran  | Industrial and mineral | 902344  | 0.36 | 1056000 | 0.41 | 1056000 | 0.54 | 1056000 | 0.54 | 1056000 | 0.54  |
| 48 | Siman abik    | Industrial and mineral | 1050000 | 0.68 | 1170000 | 0.69 | 1170000 | 0.69 | 1170000 | 0.69 | 1250000 | 0.70  |
| 49 | Siman Fars No | Industrial and mineral | 350000  | 0.38 | 350000  | 0.38 | 350000  | 0.38 | 350000  | 0.38 | 400000  | 0.45  |
| 50 | Mapna         | Industrial and mineral | 4840000 | 0.67 | 4840000 | 0.67 | 4840000 | 0.67 | 5000000 | 0.68 | 5000000 | 0.68  |

As is shown in the above table, as the asset of some of the companies is constant in a definite year, their leverage is increased. For example, Iranian Lizing Company in two first years despite the lack of change in the asset experienced the increase of leverage as 4 percent and it indicated the important role of debt in company asset. Based on the data of the above Table, we can compare six groups in terms of (debt ratio or financial leverage). As based on Kolmogrov-Smirnov test, the debt percent distribution is as normal, we applied ANOVA and LSD tests. ANOVA test is a parametric test in which the variance of two study population is applied. Based on the six activity groups in the study sample of the study, we can not use the mean comparison of two populations. To test the hypothesis various hypotheses are applied as we are faced with some cases. In the next stage, the significant difference in the group as two by two used LSD test. ANOVA test generally proves the significant difference but it can not show the difference between the groups.

**Table 2: Kolmogrov-Smirnov test to prove the normality of the data distribution  
One sample Kolmogrov-Smirnov test**

|                                |                      | VAR00001 |
|--------------------------------|----------------------|----------|
| N                              |                      | 250      |
| Normal Parameters <sup>a</sup> | Mean                 | 6890     |
|                                | Std. Deviation       | 15589    |
| Most extreme Difference        | Absolute             | 0.81     |
|                                | Positive             | 039      |
|                                | Negative             | -0.081   |
|                                | Kolmogrov-Smirnov Z  | 1.275    |
|                                | Asymp.Sig (2-tailed) | 0.077    |

a. Test distribution is Normal.  
Based on the significance level in the above table, the normality of the data is accepted and the parametric tests are applied for the analysis.

**Table 3: Variance analysis (ANOVA) between the groups in terms of the debt ratio or financial leverage  
(ANOVA)**

|                | Sum of Squares | df  | Mean Square | F     | Sig   |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 259.787        | 5   | 51.957      | 1.611 | 0.158 |
| Within Groups  | 7869.827       | 244 | 32.253      |       |       |
| Total          | 8129.614       | 249 |             |       |       |

Based on the significance level in variance analysis test, the results showed that there is no significant difference between the six groups of the companies (agriculture and food, insurance, communication and technology, pharmacy, Lizing services, industrial and mineral) at confidence level 95% in terms of the debt ratio or financial leverage.

**Table 4: LSD test between the groups in terms of debt ratio or financial leverage  
Multiple comparisons**

| (I)<br>VAR01 | (J)<br>VAR02 | Mean Difference<br>(I-J) | Std. Error | Sig.  | Confidence interval 95% |             |
|--------------|--------------|--------------------------|------------|-------|-------------------------|-------------|
|              |              |                          |            |       | Lower bound             | Upper bound |
| 1            | 2            | 3.03827*                 | 1.53794    | 0.049 | 0.0089                  | 6.0676      |
|              |              | 3.23307*                 | 1.53794    | 0.037 | 0.2037                  | 6.2624      |
|              |              | 3.15000*                 | 1.46636    | 0.033 | 0.2617                  | 6.0383      |
|              |              | 2.99867                  | 1.53794    | 0.052 | -0.0307                 | 6.0280      |
|              |              | 3.15284*                 | 1.16429    | 0.007 | 0.8595                  | 5.4462      |
|              |              |                          |            |       |                         |             |
| 2            | 1            | -3.03827*                | 1.53794    | 0.049 | -6.0676                 | -0.0089     |
|              |              | 0.19480                  | 1.60632    | 0.904 | -2.9692                 | 3.3588      |
|              |              | 0.11173                  | 1.53794    | 0.942 | -2.9176                 | 3.1411      |
|              |              | -0.03960                 | 1.60632    | 0.980 | -3.2036                 | 3.1244      |
|              |              | 0.11457                  | 1.25324    | 0.927 | -2.3540                 | 2.5831      |
|              |              |                          |            |       |                         |             |
| 3            | 1            | -3.23307*                | 1.53794    | 0.037 | -6.2624                 | -0.2037     |
|              |              | -0.19480                 | 1.60632    | 0.904 | -3.3588                 | 2.9692      |
|              |              | -0.08307                 | 1.53794    | 0.957 | -3.1124                 | 2.9463      |
|              |              | -0.23440                 | 1.60632    | 0.884 | -3.3984                 | 2.9296      |
|              |              | -0.080023                | 1.25324    | 0.949 | -2.5488                 | 2.3883      |
|              |              |                          |            |       |                         |             |
| 4            | 1            | -3.15000*                | 1.46636    | 0.033 | -6.0383                 | -0.2617     |
|              |              | -0.11173                 | 1.53794    | 0.942 | -3.1411                 | 2.9176      |
|              |              | 0.08307                  | 1.53794    | 0.957 | -2.9463                 | 3.1124      |
|              |              | -0.15133                 | 1.53794    | 0.922 | -3.1807                 | 2.8780      |
|              |              | 0.00284                  | 1.16429    | 0.998 | -2.2905                 | 2.2962      |
|              |              |                          |            |       |                         |             |
| 5            | 1            | -2.99867                 | 1.53794    | 0.052 | -6.0280                 | 0.0307      |
|              |              | -0.03960                 | 1.60632    | 0.980 | -3.1244                 | 3.2036      |
|              |              | 0.23440                  | 1.60632    | 0.884 | -2.9296                 | 3.3984      |
|              |              | 0.15133                  | 1.53794    | 0.922 | -2.8780                 | 3.1807      |
|              |              | 0.15417                  | 1.25324    | 0.902 | -2.3144                 | 2.6227      |
|              |              |                          |            |       |                         |             |
| 6            | 1            | -3.15284*                | 1.16429    | 0.007 | -5.4462                 | -0.8595     |
|              |              | -0.11457                 | 1.25324    | 0.927 | -2.5831                 | 2.3540      |
|              |              | 0.08023                  | 1.25324    | 0.949 | -2.3883                 | 2.5488      |
|              |              | -0.00284                 | 1.16429    | 0.998 | -2.2962                 | 2.2905      |
|              |              | -0.15417                 | 1.25324    | 0.902 | -2.6227                 | 2.3144      |
|              |              |                          |            |       |                         |             |

\*The mean difference is significant at the 0.05 level.

The results of LSD test showed interesting results. For example, by the view of the first row of the table, we can say that there is no significant difference between the first and fifth group, agriculture and food group with Ilzing services group and agriculture and food group with other companies had significant difference in terms of debt ratio. It should be said that this test is done only for debt ratio not the debt amount. For example, it is possible that the debt ratios in two industries (agriculture and food with LIzing services) don't have significant difference but are completely different in terms of debt Rial amount. In the next table, the debt amount of each of the companies is mentioned and the same test is done. Table 4-5 helps us with the analysis. As one of the assumptions of the current study is proving the significant difference between the systematic risk of the common stock of the companies before and after the increase of debt, we should determine the increase of debt point of the companies to apply the point as the reference point to determine the before and after the increase of debt. For example, in the following Table, Magsal Company experienced the first debt increase in 2008 and this year is applied as the reference point for the analysis of systematic risk in the next sections. All the reference points of the change of debt are shown by grey in the following Table.

**Table 5: The determination of the debt and reference points of the increase of debt (based on million RIs)**

| No. | Company            | Activity             | 2006   | 2007   | 2008   | 2009   | 2010   |
|-----|--------------------|----------------------|--------|--------|--------|--------|--------|
| 1   | Magsal             | Agriculture and food | 8000   | 8000   | 8385   | 11016  | 11234  |
| 2   | Kalber dairies     | Agriculture and food | 16000  | 16000  | 16000  | 24820  | 24820  |
| 3   | Pars vegetable oil | Agriculture and food | 151116 | 151320 | 157780 | 157780 | 157780 |
| 4   | Shokopars          | Agriculture and food | 29880  | 31920  | 31920  | 36120  | 36120  |
| 5   | Mahram             | Agriculture and food | 32760  | 30600  | 30600  | 30600  | 31820  |
| 6   | Margarine          | Agriculture and food | 84000  | 84000  | 91250  | 101640 | 101640 |

|    |                             |                               |     |          |          |          |          |          |
|----|-----------------------------|-------------------------------|-----|----------|----------|----------|----------|----------|
| 7  | Bime Dana                   | Insurance                     |     | 102310.8 | 104757.5 | 104757.5 | 104757.5 | 109316.2 |
| 8  | Bime Asia                   | Insurance                     |     | 414050   | 436170   | 436170   | 436170   | 436170   |
| 9  | Bime Parsian                | Insurance                     |     | 803000   | 988000   | 103180   | 109020   | 107160   |
| 10 | Bime Dey                    | Insurance                     |     | 167948.6 | 167948.6 | 167948.6 | 167948.6 | 253594.2 |
| 11 | Bime Alborz                 | Insurance                     |     | 215800   | 151200   | 151200   | 151200   | 178180   |
| 12 | Information services        | Communication and information |     | 152500   | 152500   | 152500   | 233365.7 | 300000   |
| 13 | Iran mobile communication   | Communication and information |     | 1568640  | 1569000  | 1569000  | 1569000  | 1917300  |
| 14 | Parsian electronic commerce | Communication and information |     | 138020   | 138020   | 138020   | 221920   | 316710   |
| 15 | Iran telecommunication      | Communication and information |     | 5545074  | 5545074  | 6800000  | 9690000  | 9690000  |
| 16 | Iran Arqam                  | Communication and information |     | 22000    | 33600    | 62700    | 62700    | 62700    |
| 17 | Aboreihan pharmacy          | Pharmacy                      |     | 22800    | 22800    | 22800    | 31600    | 351000   |
| 18 | Dr. Abidi Pharmacy          | Pharmacy                      |     | 28980    | 34560    | 40950    | 40950    | 40950    |
| 19 | Pharaby pharmacy            | Pharmacy                      |     | 64000    | 105000   | 110200   | 110200   | 109520   |
| 20 | Amin pharmacy               | Pharmacy                      |     | 27000    | 36850    | 44460    | 49880    | 49880    |
| 21 | Osveh pharmacy              | Pharmacy                      |     | 21600    | 21600    | 26040    | 26040    | 26040    |
| 22 | Kosar pharmacy              | Pharmacy                      |     | 51300    | 67100    | 74400    | 74400    | 74400    |
| 23 | Lizing Sanat O madan        | Lising services               |     | 320000   | 320000   | 320000   | 373500   | 390100   |
| 24 | Lising Rayan Saypa          | Lising services               |     | 252000   | 392500   | 391500   | 413600   | 413600   |
| 25 | Lizing kHodro Qadir         | Lising services               |     | 219000   | 219000   | 219000   | 219000   | 236800   |
| 26 | Iran lizing                 | Lising services               |     | 237000   | 275400   | 275400   | 315400   | 344400   |
| 27 | Lizing Iranian              | Lising services               |     | 740000   | 780000   | 99600    | 99600    | 99600    |
| 28 | Mashine sasi arak           | Industrial mineral            | and | 486000   | 469800   | 509600   | 509600   | 509600   |
| 29 | Shishe Hamedan              | Industrial mineral            | and | 23850    | 23950    | 37520    | 42780    | 42780    |
| 30 | Mes Bahonar                 | Industrial mineral            | and | 182250   | 182250   | 182250   | 182250   | 309400   |
| 31 | Petrochimi Abadan           | Industrial mineral            | and | 108800   | 167900   | 243000   | 243000   | 243000   |
| 32 | Golgozar                    | Industrial mineral            | and | 154000   | 154000   | 154000   | 183300   | 183300   |
| 33 | Foulad Aliaji Yazd          | Industrial mineral            | and | 19200    | 20000    | 36600    | 46622.52 | 46622.52 |
| 34 | Parskhazar                  | Industrial mineral            | and | 64512    | 65520    | 65520    | 89395.7  | 94227.9  |
| 35 | Palayesh Naft Isfahan       | Industrial mineral            | and | 2205997  | 2205997  | 2205997  | 3200000  | 3200000  |
| 36 | Palayesh Naft Tabriz        | Industrial mineral            | and | 1262368  | 1262368  | 1559919  | 1559919  | 1559919  |
| 37 | Mehvar Khodro               | Industrial mineral            | and | 201000   | 210800   | 210800   | 210800   | 210800   |
| 38 | Tamir Mashine               | Industrial mineral            | and | 10000    | 17360    | 22100    | 22100    | 24420    |
| 39 | Ring Mashhad                | Industrial mineral            | and | 77015.5  | 77015.5  | 83600    | 83600    | 83600    |
| 40 | Elektrik khodro Sharq       | Industrial mineral            | and | 74550    | 86400    | 102600   | 102600   | 118260   |
| 41 | parskhodro                  | Industrial mineral            | and | 876000   | 1125000  | 1125000  | 1125000  | 1200000  |
| 42 | Kashi Isfahan               | Industrial mineral            | and | 105000   | 106500   | 146000   | 146000   | 146000   |
| 43 | Kashi Alvand                | Industrial mineral            | and | 132500   | 132500   | 172700   | 226080   | 226080   |
| 44 | Kashi Sina                  | Industrial mineral            | and | 55890    | 55890    | 58320    | 61965    | 61965    |
| 45 | Kashi Hafez                 | Industrial                    | and | 36600    | 45360    | 59840    | 59840    | 59840    |

|    |               |                    |     |          |         |         |         |         |
|----|---------------|--------------------|-----|----------|---------|---------|---------|---------|
|    |               | mineral            |     |          |         |         |         |         |
| 46 | Siman sofian  | Industrial mineral | and | 175000   | 175000  | 175000  | 175000  | 243200  |
| 47 | Siman Tehran  | Industrial mineral | and | 324843.8 | 432960  | 570240  | 570240  | 570240  |
| 48 | Siman abik    | Industrial mineral | and | 714000   | 807300  | 807300  | 807300  | 875000  |
| 49 | Siman Fars No | Industrial mineral | and | 133000   | 133000  | 133000  | 133000  | 180000  |
| 50 | Mapna         | Industrial mineral | and | 3242800  | 3242800 | 3242800 | 3400000 | 3400000 |

As is shown in the above table, exactly half of the companies, 25 companies had increasing debt in 2007 as the second year and after that the years after the increase of debt are considered. Again for statistical tests, Kolmmogrov-Smirnov Test is used as the pre-requirement of other tests. The results of the study showed that the data distribution is non-normal in terms of debt amount and non-parametric tests are applied. Equal to ANOVA test in non-parametric tests is a test called Kruskal Wallis Test and the results are mentioned in the following.

**Table 6: Kolmmogrov-Smirnov Test between the groups to prove the normality of the debt distribution One-sample Kolmmogrov-Smirnov Test**

|                                |               |          | VAR00001  |
|--------------------------------|---------------|----------|-----------|
| N                              |               |          | 250       |
| Normal Parameters <sup>a</sup> | Mean          |          | 5.0601E5  |
|                                | Std.Deviation |          | 1.21296E6 |
| Most extreme Difference        | Absolute      | Positive | 0.341     |
|                                |               | Negative | 0.335     |
| Kolmogrov-Smirnov Z            |               |          | -0.341    |
| Asymp.Sig (2-tailed)           |               |          | 5.387     |
|                                |               |          | 0.000     |

**Table 7: Kruskal Wallis Test between the groups in terms of the debt amount Ranks**

| VAR00002   | N   | Mean Rank |
|------------|-----|-----------|
| VAR00001 1 | 30  | 52.47     |
| 2          | 25  | 148.28    |
| 3          | 25  | 165.28    |
| 4          | 30  | 57.48     |
| 5          | 25  | 174.04    |
| 6          | 115 | 138.14    |
| TOTAL      | 250 |           |

Test Statistics <sup>a,b</sup>

|            |  | VAR00001 |
|------------|--|----------|
| Chi-Square |  | 81.975   |
| Df         |  | 5        |
| Asymp.Sig. |  | 0.000    |

a. Kruskal Wallis Test

Ranks

| VAR00002   | N   | Mean Rank |
|------------|-----|-----------|
| VAR00001 1 | 30  | 52.47     |
| 2          | 25  | 148.28    |
| 3          | 25  | 165.28    |
| 4          | 30  | 57.48     |
| 5          | 25  | 174.04    |
| 6          | 115 | 138.14    |

b. Grouping variables:  
VAR00002

Based on the significance level in Kruskal Wallis Test, the inequality between the groups is accepted, there is a significant difference between the groups in terms of debt. The first part of this chapter is finished by doing the tests of financial leverage and now the second part, the systematic risks of the companies and the significant difference

between the systematic risk of the common stock of the companies before and after the increase of debt is calculated.

### The statistical analysis of systematic risk

As to achieve the initial data of the study Rahavard Novin software is applied, it is not required to calculate the systematic risk as separately and all the calculations are done in this software as assumptions. The following Table showed the systematic risk for the studied companies in the studied years.

**Table 8: The systematic risk (Beta) for the studied companies**

| No. | Company                     | Activity                      |  | 2006   | 2007   | 2008   | 2009   | 2010   |
|-----|-----------------------------|-------------------------------|--|--------|--------|--------|--------|--------|
| 1   | Magsal                      | Agriculture and food          |  | 0.4510 | 0.4678 | 0.8170 | 0.7693 | 0.6278 |
| 2   | Kalber dairies              | Agriculture and food          |  | 1.3452 | 0.9026 | 1.8373 | 1.0911 | 1.9736 |
| 3   | Pars vegetable oil          | Agriculture and food          |  | 1.8365 | 1.9187 | 0.6384 | 0.8956 | 0.8728 |
| 4   | Shokopars                   | Agriculture and food          |  | 0.3563 | 0.4673 | 0.5749 | 0.6938 | 0.5702 |
| 5   | Mahram                      | Agriculture and food          |  | 0.6572 | 0.7268 | 0.9355 | 1.9728 | 0.7693 |
| 6   | Margarine                   | Agriculture and food          |  | 0.6458 | 0.8722 | 0.7369 | 0.7802 | 0.8029 |
| 7   | Bime Dana                   | Insurance                     |  | 1.0826 | 1.0166 | 1.9341 | 0.7389 | 1.9831 |
| 8   | Bime Asia                   | Insurance                     |  | 2.0176 | 1.8261 | 1.9822 | 1.6731 | 1.0774 |
| 9   | Bime Parsian                | Insurance                     |  | 0.4365 | 0.5771 | 0.6584 | 0.5817 | 0.6093 |
| 10  | Bime Dey                    | Insurance                     |  | 0.7356 | 0.6389 | 0.8674 | 0.7629 | 0.8482 |
| 11  | Bime Alborz                 | Insurance                     |  | 0.8366 | 0.7256 | 0.8092 | 0.5890 | 0.5372 |
| 12  | Information services        | Communication and information |  | 1.0636 | 1.0824 | 1.093  | 1.8618 | 1.6741 |
| 13  | Iran mobile communication   | Communication and information |  | 0.5159 | 0.7262 | 0.8653 | 0.7549 | 0.6584 |
| 14  | Parsian electronic commerce | Communication and information |  | 0.7618 | 0.8726 | 0.7382 | 0.9509 | 0.7649 |
| 15  | Iran telecommunication      | Communication and information |  | 1.0871 | 0.9261 | 1.4873 | 1.9743 | 1.0867 |
| 16  | Iran Arqam                  | Communication and information |  | 0.6359 | 0.4792 | 0.7929 | 0.7019 | 0.7394 |
| 17  | Aboreihan pharmacy          | Pharmacy                      |  | 1.7629 | 1.5261 | 0.9645 | 1.0738 | 1.9478 |
| 18  | Dr. Abidi Pharmacy          | Pharmacy                      |  | 1.8216 | 0.9453 | 0.7647 | 1.1176 | 0.9738 |
| 19  | Pharaby pharmacy            | Pharmacy                      |  | 0.7164 | 0.8167 | 0.8527 | 0.8949 | 0.8953 |
| 20  | Amin pharmacy               | Pharmacy                      |  | 2.1180 | 2.1019 | 1.8628 | 1.0784 | 2.4761 |
| 21  | Osveh pharmacy              | Pharmacy                      |  | 0.5314 | 0.5883 | 0.7548 | 0.8109 | 0.6403 |
| 22  | Kosar pharmacy              | Pharmacy                      |  | 1.0516 | 1.9732 | 1.2908 | 1.0856 | 1.9834 |
| 23  | Lizing Sanat O madan        | Lising services               |  | 0.7116 | 0.6725 | 0.6592 | 0.8527 | 0.7540 |
| 24  | Lising Rayan Saypa          | Lising services               |  | 0.4937 | 0.7529 | 0.5674 | 0.5742 | 0.4873 |
| 25  | Lizing kHodro Qadir         | Lising services               |  | 0.7351 | 0.8521 | 0.7368 | 0.7929 | 0.8621 |
| 26  | Iran lizing                 | Lising services               |  | 1.7169 | 2.7811 | 1.6748 | 1.0592 | 1.0281 |
| 27  | Lizing Iranian              | Lising services               |  | 0.6251 | 1.6735 | 0.9845 | 0.8065 | 0.9166 |
| 28  | Mashine sasi arak           | Industrial and mineral        |  | 1.9183 | 1.0811 | 0.7369 | 1.6147 | 0.9537 |
| 29  | Shishe Hamedan              | Industrial and mineral        |  | 0.7256 | 1.9722 | 1.9730 | 0.6893 | 0.8579 |
| 30  | Mes Bahonar                 | Industrial and mineral        |  | 0.3556 | 0.4762 | 0.7388 | 0.5783 | 0.6747 |
| 31  | Petrochimi Abadan           | Industrial and mineral        |  | 0.7167 | 0.5839 | 0.4930 | 0.6093 | 0.7861 |
| 32  | Golgohar                    | Industrial and mineral        |  | 1.6157 | 1.7160 | 1.9271 | 1.5811 | 1.5973 |



|    |                  |        |                    |     |        |        |        |        |        |
|----|------------------|--------|--------------------|-----|--------|--------|--------|--------|--------|
| 33 | Foulad Yazd      | Aliaji | Industrial mineral | and | 0.9179 | 0.8709 | 0.8372 | 0.8548 | 0.7091 |
| 34 | Parskhazar       |        | Industrial mineral | and | 0.6051 | 0.5648 | 1.0083 | 0.8267 | 0.9630 |
| 35 | Palayesh Isfahan | Naft   | Industrial mineral | and | 1.9261 | 1.5245 | 1.5381 | 1.9654 | 0.9435 |
| 36 | Palayesh Tabriz  | Naft   | Industrial mineral | and | 1.1632 | 0.8372 | 0.9371 | 0.7838 | 0.9183 |
| 37 | Mehvar Khodro    |        | Industrial mineral | and | 0.7167 | 0.7453 | 0.8726 | 0.8099 | 0.8371 |
| 38 | Tamir Mashine    |        | Industrial mineral | and | 0.9812 | 1.8275 | 1.1167 | 1.0389 | 1.0593 |
| 39 | Ring Mashhad     |        | Industrial mineral | and | 1.0837 | 1.9327 | 1.8271 | 0.9471 | 1.0371 |
| 40 | Elektrik Sharq   | khodro | Industrial mineral | and | 0.7440 | 0.8367 | 0.5693 | 0.9492 | 0.8949 |
| 41 | parskhodro       |        | Industrial mineral | and | 1.9871 | 1.0028 | 0.8721 | 1.4671 | 0.9657 |
| 42 | Kashi Isfahan    |        | Industrial mineral | and | 0.6359 | 1.6801 | 0.8176 | 0.8491 | 0.9547 |
| 43 | Kashi Alvand     |        | Industrial mineral | and | 0.7166 | 0.4633 | 0.7281 | 0.8301 | 0.7381 |
| 44 | Kashi Sina       |        | Industrial mineral | and | 1.0638 | 1.0723 | 1.5630 | 1.0738 | 1.0911 |
| 45 | Kashi Hafez      |        | Industrial mineral | and | 0.7418 | 0.6091 | 0.7027 | 0.8920 | 0.5281 |
| 46 | Siman sofian     |        | Industrial mineral | and | 0.5701 | 0.4927 | 0.6587 | 0.7856 | 0.7391 |
| 47 | Siman Tehran     |        | Industrial mineral | and | 1.0726 | 0.7374 | 0.5648 | 0.7499 | 0.7381 |
| 48 | Siman abik       |        | Industrial mineral | and | 0.5672 | 0.6478 | 0.9366 | 0.4891 | 0.6734 |
| 49 | Siman Fars No    |        | Industrial mineral | and | 0.4006 | 0.5092 | 0.7658 | 0.8072 | 0.6027 |
| 50 | Mapna            |        | Industrial mineral | and | 0.7891 | 0.6481 | 0.6309 | 0.8328 | 0.8911 |

Beta coefficient formula in the third chapter helps us to interpret the beta coefficients in the above table. First if the beta coefficient of one share is 1, it shows that the covariance of its return and market portfolio variance is equal. The second interpretation of beta coefficient is such that we can calculate the change of pricing of a share in relation to total market. It is said that if the company share beta of is more than 1, the stock pricing change is more than that of the market. For example, if Beta reaches 2, it means that its covariance is equal to the variance of portfolio return variance in the market. It shows that the consistency of its return over the time is double than the variance value of the market indicator. Thus, if some changes are occurred in stock market price indicator, it is expected the return of the share observed some considerable changes. In the above tables, the reference points are defined again to evaluate the significant difference between the six groups in terms of systematic risk level. As is shown in the below tables, the data distribution is as non-normal and Kruskal Wallis Test should be used.

**Table 9: Kolmogrov-Smirnov Test between the groups to prove the normality of the systematic risk distribution (One-sample Kolmogrov-Smirnov Test)**

|                                |                      |          |                 |
|--------------------------------|----------------------|----------|-----------------|
|                                |                      |          | <b>VAR00001</b> |
| N                              |                      |          | 250             |
| Normal Parameters <sup>a</sup> | Mean                 |          | 0.9955          |
|                                | Std. Deviation       |          | 0.46619         |
| Most extreme Difference        | Absolute             | Positive | 0.201           |
|                                |                      | Negative | 0.201           |
| Kolmogrov-Smirnov Z            |                      |          | -0.107          |
|                                | Asymp.Sig (2-tailed) |          | 3.181           |
|                                |                      |          | 0.000           |

**Table 10: Kruskal Wallis Test between the groups in terms of systematic risk Ranks**

| VAR00002 | N   | Mean Rank |
|----------|-----|-----------|
| VAR00001 | 30  | 109.83    |
| 2        | 25  | 121.22    |
| 3        | 25  | 129.96    |
| 4        | 30  | 165.65    |
| 5        | 25  | 112.48    |
| 6        | 115 | 121.90    |
| TOTAL    | 250 |           |

Test Statistics<sup>a,b</sup>

|            | VAR00001 |
|------------|----------|
| Chi-Square | 11.934   |
| Df         | 5        |
| Asymp.Sig. | 0.036    |

a. Kruskal Wallis Test

b. Grouping variables:  
VAR00002

Again, based on the significance level in Kruskal Wallis Test, the results showed that there is a significant difference between the six groups of the companies (agriculture and food, insurance, communication and technology, pharmacy, lising services, industrial and mineral) at confidence level 95% in terms of systematic risk. Now, we can investigate the second aim of the study determining the significant difference between the systematic risk of the common stock of the companies before and after the increase of the debt, payment (the first purpose of the study is tested in the next section). One way to achieve this purpose is using paired comparison test or Wilcoxon test and doing each of them is relied on the normality or non-normality of the data distribution. In these tests, one population is the systematic risk of the companies before the increase of debt and the other population is the systematic risk of the companies after the increase of debt and the separation point of the two of them is the reference points shown in the previous tables. The results of Kolmmogrov-Smirnov Test, Table 4-9 showed the non-normality of the data distribution and caused to use Wilcoxon test.

**Table 11: The mean systematic risk of the companies (before and after the increase of debt)**

| No. | Company                     | Activity                      | Mean before the increase of debt | Mean after the increase of debt |
|-----|-----------------------------|-------------------------------|----------------------------------|---------------------------------|
| 1   | Magsal                      | Agriculture and food          | 0.4594                           | 0.738033                        |
| 2   | Kalber dairies              | Agriculture and food          | 1.3617                           | 1.53235                         |
| 3   | Pars vegetable oil          | Agriculture and food          | 1.8365                           | 1.081375                        |
| 4   | Shokopars                   | Agriculture and food          | 0.3563                           | 0.57655                         |
| 5   | Mahram                      | Agriculture and food          | 1.073075                         | 0.7693                          |
| 6   | Margarine                   | Agriculture and food          | 0.759                            | 0.773333                        |
| 7   | Bime Dana                   | Insurance                     | 1.0826                           | 1.418175                        |
| 8   | Bime Asia                   | Insurance                     | 2.0176                           | 1.6397                          |
| 9   | Bime Parsian                | Insurance                     | 0.4365                           | 0.606625                        |
| 10  | Bime Dey                    | Insurance                     | 0.7512                           | 0.8482                          |
| 11  | Bime Alborz                 | Insurance                     | 0.7401                           | 0.5372                          |
| 12  | Information services        | Communication and information | 1.079667                         | 1.76795                         |
| 13  | Iran mobile communication   | Communication and information | 0.5159                           | 0.7512                          |
| 14  | Parsian electronic commerce | Communication and information | 0.790867                         | 0.8579                          |
| 15  | Iran telecommunication      | Communication and information | 1.0066                           | 1.5161                          |
| 16  | Iran Arqam                  | Communication and information | 0.55755                          | 0.744733                        |
| 17  | Aboreihan pharmacy          | Pharmacy                      | 1.417833                         | 1.5108                          |
| 18  | Dr. Abidi Pharmacy          | Pharmacy                      | 1.8216                           | 0.95035                         |
| 19  | Pharaby pharmacy            | Pharmacy                      | 0.7164                           | 0.8649                          |
| 20  | Amin pharmacy               | Pharmacy                      | 2.118                            | 1.8798                          |
| 21  | Osveh pharmacy              | Pharmacy                      | 0.55985                          | 0.735333                        |
| 22  | Kosar pharmacy              | Pharmacy                      | 1.0516                           | 1.58325                         |
| 23  | Lizing Sanat O madan        | Lising services               | 0.6811                           | 0.80335                         |

|                   |                       |                        |          |          |
|-------------------|-----------------------|------------------------|----------|----------|
| 24                | Lising Rayan Saypa    | Lising services        | 0.4937   | 0.59545  |
| 25                | Lizing kHodro Qadir   | Lising services        | 0.779225 | 0.8621   |
| 26                | Iran lizing           | Lising services        | 1.7169   | 1.6358   |
| 27                | Lizing Iranian        | Lising services        | 0.6251   | 1.095275 |
| 28                | Mashine sasi arak     | Industrial and mineral | 1.4997   | 1.101767 |
| 29                | Shishe Hamedan        | Industrial and mineral | 1.3489   | 1.1734   |
| 30                | Mes Bahonar           | Industrial and mineral | 0.537225 | 0.6747   |
| 31                | Petrochimi Abadan     | Industrial and mineral | 0.7167   | 0.618075 |
| 32                | Golgohar              | Industrial and mineral | 1.752933 | 1.5892   |
| 33                | Foulad Aliaji Yazd    | Industrial and mineral | 0.9179   | 0.818    |
| 34                | Parskhazar            | Industrial and mineral | 0.6051   | 0.8407   |
| 35                | Palayesh Naft Isfahan | Industrial and mineral | 1.6629   | 1.45445  |
| 36                | Palayesh Naft Tabriz  | Industrial and mineral | 1.0002   | 0.879733 |
| 37                | Mehvar Khodro         | Industrial and mineral | 0.7167   | 0.816225 |
| 38                | Tamir Mashine         | Industrial and mineral | 0.9812   | 1.2606   |
| 39                | Ring Mashhad          | Industrial and mineral | 1.5082   | 1.270433 |
| 40                | Electric khodro Sharq | Industrial and mineral | 0.744    | 0.812525 |
| 41                | parskhodro            | Industrial and mineral | 1.9871   | 1.076925 |
| 42                | Kashi Isfahan         | Industrial and mineral | 0.6359   | 1.075375 |
| 43                | Kashi Alvand          | Industrial and mineral | 0.58995  | 0.765433 |
| 44                | Kashi Sina            | Industrial and mineral | 1.06805  | 1.242633 |
| 45                | Kashi Hafez           | Industrial and mineral | 0.7418   | 0.682975 |
| 46                | Siman sofian          | Industrial and mineral | 0.626775 | 0.7391   |
| 47                | Siman Tehran          | Industrial and mineral | 1.0726   | 0.69775  |
| 48                | Siman abik            | Industrial and mineral | 0.5672   | 0.683725 |
| 49                | Siman Fars No         | Industrial and mineral | 0.6207   | 0.6027   |
| 50                | Mapna                 | Industrial and mineral | 0.689367 | 0.86195  |
| <b>Total mean</b> |                       |                        | 0.987939 | 1.008326 |

**Table 12: Wilcoxon test between the mean of systematic risk before and after the increase of debt Ranks**

|                    |                | N               | Mean Rank | Sum of Ranks |
|--------------------|----------------|-----------------|-----------|--------------|
| VAR00002- VAR00001 | Negative Ranks | 19 <sup>a</sup> | 28.00     | 532.00       |
|                    | Positive Ranks | 31 <sup>b</sup> | 23.97     | 743.00       |
|                    | Ties           | 0 <sup>c</sup>  |           |              |
|                    | Total          | 50              |           |              |

a. VAR00002<VAR00001  
 b. VAR00002>VAR00001  
 c. VAR00002=VAR00001

Test Statistics <sup>b</sup>

| VAR00002- VAR00001 |                     |
|--------------------|---------------------|
| Z                  | -1.018 <sup>a</sup> |
| Asymp.Sig.         | 0.308               |

- a. Based on negative ranks
- b. Wilcoxon Signed Ranks Test

As the significance level is more than 0.05, there is no significant difference between the systematic risk ( $\beta$ ) of the common stock of the companies before and after the debt increase. The second hypothesis is rejected. This result is completely consistent with the results of the study of (Sinayi and Khoram, 2004) proving the lack of significant distribution of the systematic risk of the companies before and after the increase of debt.

As it was said in the third chapter, in most of the similar studies, it is recommended that without considering the normality or the lack of data distribution, F statistics or Fisher's is applied for such comparison. If the hypothesis deals with the comparison of two groups, for its validity, the mean comparison of two of them should be applied. To test the equality of the mean of two of them, we should define whether the variance of them is equal or not. In other words, the variances equality tests is prior to the means equality test.

For the variance equality test (Levene test), F statistics was applied. The following tables, showed the result of the test about the systematic risk before and after the increase of debt.

**Table 13: The mean comparison test of two groups (before and after the debt increase)**

| VAR02      | N  | Mean    | Std. Deviation | Std Error Mean |
|------------|----|---------|----------------|----------------|
| VAR00001 1 | 50 | -0.9879 | 0.47720        | 0.06749        |
| 2          | 50 | 1.0083  | 0.36445        | 0.05154        |

Independent samples Test

|       |                             | Levene's Test for Equality of Variances |       | t      | df     | Sig. (2-tailed) | t-test for Equality of Means |                       | 95% Confidence Interval of the Difference |         |
|-------|-----------------------------|---|-------|--------|--------|-----------------|------------------------------|-----------------------|---|---------|
|       |                             | F                                       | Sig.  |        |        |                 | Mean Difference              | Std. Error Difference |   |         |
| VAR01 | Equal variances assumed     | 2.960                                   | 0.088 | -0.240 | 98     | 0.811           | -0.02039                     | 0.08492               | -0.18890                                  | 0.14813 |
|       | Equal Variances not assumed |   |       | -0.240 | 91.651 | 0.811           | -0.02039                     | 0.08492               | -0.18905                                  | 0.14827 |
|       |                             |   |       |        |        |                 |                              |                       |   |         |
|       |                             |   |       |        |        |                 |                              |                       |   |         |

The test has two results. The first one is the descriptive statistics of two samples in which the number of data and descriptive statistics of the systematic risk are shown in terms of two groups before and after the increase of debt separately. The second one is inference statistics including the results of the test as two parts: The first part deals with the variance equality test of two groups and the second part presents the results of mean equality test of two groups for equality and inequality of the variances. As is shown, the significance level of Levene test is 0.088 and bigger than significance level 5%. Thus the variances equality is supported. In the second part of the table, the significance level in mean equality test by the assumption of variance equality is more than 5% and the inequality of the mean of systematic risk before and after the increase of debt at error level 5% is rejected. It means that there is no significant difference between the systematic risk ( $\beta$ ) of the common stock of the companies before and after the increase of debt. Thus, the results of the test proved the results of the previous test. Upper and lower bounds are applied for the analysis in the above table. As the upper bound is positive and lower bound is negative, the difference of the mean of two groups is not significant and the means equality is not rejected.

**Regression analysis between two variables of financial leverage and systematic risk**

As the first purpose of the study is the identification of the linear relationship between the financial leverage and systematic risk. In this section by the data of two previous stages, we apply the regression analysis of two variables. In the regression, we estimate the mathematical relation and its analysis, as the quality of the unknown variable is determined by the variable or known variables. The regression method is such that at first the significance of the total model of the regression is tested and it is done via ANOVA table. Then, the significance of each of the independent variable coefficients should be evaluated and it is done by coefficients Table. The tables of regression analysis output are shown in the following.

**Table 4-14 the analysis of the regression relation between the financial leverage and systematic risk Variables Entered/Removed<sup>b</sup>**

| Model | Variables Entered                | Variables Removed | Method |
|-------|----------------------------------|-------------------|--------|
| 1     | Financial Structure <sup>a</sup> | 0                 | Enter  |

- a. All requested variables entered.
- b. Dependent Variable: Systematic Risk

**Model summary**

| Model | R                 | R square | Adjusted R. Square | Std. Error of the Estimate |
|-------|-------------------|----------|--------------------|----------------------------|
| 1     | 0.48 <sup>a</sup> | 0.002    | -0.002             | 0.46658                    |

- a. Predictors: (Constant), Financial Structure

ANOVA<sup>b</sup>

| Model |            | Sum of Squares | df  | Mean Square | F     | Sig.               |
|-------|------------|----------------|-----|-------------|-------|--------------------|
| 1     | Regression | 0.127          | 1   | 0.127       | 0.584 | 0.445 <sup>a</sup> |
|       | Residual   | 53.988         | 248 | 0.218       |       |                    |
|       | Total      | 54.115         | 249 |             |       |                    |

- a. Predictors: (Constant), Financial Structure
- b. Dependent Variable: Systematic Risk

**Coefficients<sup>a</sup>**

| Model |                     | Unstandardized Coefficients |            | Standardized Coefficients Beta | t      | Sig.  |
|-------|---------------------|-----------------------------|------------|--------------------------------|--------|-------|
|       |                     | B                           | Std. Error |                                |        |       |
| 1     | (Constant)          | 1.095                       | 0.134      |                                | 8.176  | 0.000 |
|       | Financial Structure | -0.145                      | 0.190      | -0.048                         | -0.764 | 0.445 |

- a. Dependent variable: Systematic risk

As is shown, the result has four outputs, the first output indicates the entered independent variables (in simple linear regression it is including only one variable and here is financial leverage variable), the removed variables and the applied method in determining the regression are shown. The second output is the multiple correlation coefficient (in simple linear regression with two variables, multiple correlation coefficient is equal to the absolute value of their correlation coefficient), the determination coefficient (variability value in dependent variable and it is explained by regression), the adjusted determination coefficient and standard error of estimation are presented (explained in the fifth chapter).

The third output is consisting of regression variance analysis to study the absoluteness of the linear relationship between two variables. The study hypothesis of the significance test of total regression model is as following:

**H0:** There is no linear relationship between two variables.

**H1:** There is a linear relationship between two variables.

In regression variance analysis table, as is shown, significance level is more than 5%. Thus the linearity of two variables is rejected. It should be said that by this indicator, only it can be guessed about the linearity or non-linearity of two variables. In ANOVA table, Regression row showed the changes of dependent variable determined via independent variables. Residual row indicated the changes of dependent variable being determined by other factors (random and accidental). In the fourth output and column B, constant value and independent variable coefficient are presented in regression equation, respectively. The coefficients Table is including two unstandardized (B) and standardized coefficients ( $\beta$ ). In unstandardized coefficients, the variables scale is not equal with each other but in standardized coefficients, the variables scale is equal and the variables are compared. In the current example, for one unit of change in financial leverage, -0.048 change is occurred in the systematic risk and this issue is with the assumption of constant nature of other variables. According to the results of the above tables, it can be said that there is no linear relation between two variables and null hypothesis is supported and the H1 (There is a positive linear relation between the financial leverage and systematic risk) of the study is rejected. If the two hypotheses are rejected, the data analysis is finished. Perhaps the most important reason to justify the lack of significant association is the lack of competitiveness of capital market in Iran, permanent use of the current debt instead of long-term debt in capital structure and the lack of variety of securities in Iran capital market. Removing each of the obstacles can have vivid perspective for Iran stock market and it is studied with some solutions in the next chapter.

## Summary

This chapter of the study deals with the analysis of the collected data in Rahavard Novin software regarding the systematic risk and financial leverage. After performing the study tests as Kolmogorov-Smirnov, ANOVA, LSD, Kruskal Wallis and Wilcoxon test for two variables of the study, the relation of this variable is analyzed by linear regression. The result of the effectiveness of the independent variable, financial leverage on dependent variable, the systematic risk showed the lack of significant linear relation between two variables. Thus, the first hypothesis of the study is not supported. Wilcoxon and means comparison tests of two groups and F statistics showed the lack of significant difference between the systematic risk of the companies before and after the increase of debt. The second hypothesis of the study is rejected.

## Conclusion

The results of data analysis in the regression showed that there is no significant linear association between two variables and the increase and reduction of financial leverage didn't have any influence on the systematic risk of the companies and the first hypothesis of the study is rejected. It can be said that in the tables of the test, the estimation standard error meant the distribution of the points around the regression line in two-dimensional space. The higher the value of the indicator, the more the distribution of the points around the regression line. The measurement unit of this indicator is exactly the measurement unit of dependent variable (systematic risk). The results of the study are consistent with the results of the study of (Sinayi and Khoram, 2004) and despite the results of the researches (Hamada, 1972), (Benzion and Shalit, 1975), (Dunn, 2001). According to Sinayi and Khoram (2004), this is occurred for the reason that the theories and tests in the review of literature are raised in a competitive market not consistent with the special conditions of our society and market and the examples of this limitation in our country is the shortage of non-bank and non-state financial institutions to play complementary roles in the market as financial mediators and cause healthy competition and the development of financing activities. The government by creating open economical space should provide the more activities of such institutions. Another justification of the results is the debt structure of the companies. Due to the ignorance of this issue in most cases, the current debts of the companies are considerable compared to the long-term debts. The current debt is such that the increase of sum components doesn't create any risk. For example, the paid stock divided due to the lack of constant costs can not increase the risk of the company. Thus, long-term financing and the reduction of debt in capital structure is

recommended for the increase of company growth. The lack of variety of securities in Iran market caused the limitation of the investors in their investment decisions and the companies namely in the decisions of financing. By the variety in securities, some conditions are created by which the investors can take the suitable investment by the possibility of purchasing the various securities.

#### **Responding the study hypotheses and purposes**

- 1- The identification of the positive linear relationship between the financial leverage and systematic risk: Based on the regression test results, the linear relationship between two variables is rejected.
- 2- The significant difference between the systematic risk of the common stock of the companies before and after the debt increase: based on the result of Wilcoxon test and mean comparison tests of two groups, the inequality of mean of systematic risk before and after the increase of debt at error level 5% is rejected. It means that there is no significant difference between the systematic risk ( $\beta$ ) of the common stock of the companies before and after the increase of debt. The second hypothesis is rejected.

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