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Examining the Relationship between Risk and Excess Return of Listed Companies in Iran

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A B S T R A C T

This paper is trying to investigate if there is any relationship between firm value and risk. In financial literature risk of companies are divided into two main groups: systematic risk and unsystematic risk, so in this study we have tried to mention both of these risks. IN order to model the impact of risk on firm value we used operating leverage, financial leverage and intrinsic business risk as functions of risk and excess return as a function of firm value, so, we have three independent variables and one dependent variable. Excess return is the rerun which company has produced over fixed rate of return and can be used as one of firm value index. In order to test hypotheses we have use panel data to estimate multiple regression and collect the information of 90 samples of non-financial Iranian listed companies for the period from 2010 to 2014. Our empirical findings suggest that the degree of operating leverage and intrinsic business risk explain a large portion of the variation of excess return in dollar when financial leverage is not meaningfully correlated with the firm value .according to empirical findings of research we can conclude that there is a significant meaningful relationship between firm value and risk.

Keywords: Operating Leverage, Financial Leverage, Intrinsic Business Risk, Firm Value.

INTRODUCTION

The purpose of this paper is to investigate the effect of operating, financial and business risks on firm value. The selected structure or configuration of liabilities and assets determines the total risk of the firm. Capital market theory suggesting the Capital Asset Pricing Model (CAPM) of William F Sharpe (1964), Mossin (1966), Fama (1968) and Lintner (1969) clearly and explicitly specifies the relevant measure of risk of a security issued by a firm (systematic or non-diversifiable risk)(Jacoby, Fowler, & Gottesman, 2000; William F. Sharpe, 1991). Systematic risk is a measure of the sensitivity in determining an individual security's return to the return of the market portfolio and only the systematic risk is relevant in determining an individual security's return.

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In order to drive meaningful policy implications from analyzing the determinants of firm value, decision variables such as assets, capital structures and business risk are taken into account. In this study, we use the Capital Asset Pricing Model (CAPM), and both the theoretical and empirical work of Slim Abid and Mseddi (2004) to develop a model that establishes a theoretical relationship between firm value and risk, as measured by the degrees of operating and financial leverages, and the intrinsic business risk.

The capital asset pricing model of Sharpe, Lintner and Mossin is a model of equilibrium securities prices. The model, and its ex post variant the market model, have been extensively covered in the literature. We will not develop the theory again here. The reader who desires a thorough treatment of the foundation and development of the model is referred to the seminal works or the excellent reviews in Beaver(Beaver, Kettler, & Scholes, 1970). However, it will be necessary to set forth the basic formulation for our use in the following sections. The capital asset pricing model makes the following assumptions.

(1) All investors are single-period, risk-averse maximizes of the expected utility of terminal wealth.

(2) They find it possible to make their optimal portfolio decisions solely on the basis of the mean and standard deviation of the probability distributions of terminal wealth associated with the various portfolios.

(3) They all have the same decision horizon, and over this period the mean and standard deviation of the probability distributions exist.

(4) They have homogeneous expectations regarding the mean and standard deviation of the probability distributions.

(5) There are perfect capital markets.

METHODOLOGY

This study is correlational and focuses to determine the presence of relation between study variables and deductive method was used to extrapolate the results to the population of the study. To collect data required for the study financial statements, Tadbir Pardaz and Rah-Avard Novin software and TSE archive were used.

Target Population

There is a prerequisite for any research, i.e. the data required for the study should be available and in access. Currently, in Iran, only the information of the companies listed in Tehran Stock Exchange (TSE) is available. Hence, for the purpose of this study, all companies listed TSE during the period of 2010 to 2014 are considered as the population of the study.

Sampling Method & Sample Size

Considering the expansion of the population, a sample group is chosen. For selecting the companies, purposive sampling method was used based on the following delimitations:

1. Companies listed TSE during the period of 2010 to 2014.

2. Banks and financial institutions, investment companies, financial intermediation and holding

Companies, which have different reporting structure, are excluded from the sample.

3. Selected companies didn't have stop Icon more than three months during the period.

4. During the selected period their financial year has not changed.

Accordingly, 90 companies were selected as the sample of the study.

Variables description

We classify research's variables into 2 groups: Independent variables and Dependent variables. Variables and the way of calculating them are expressed in the following table:

Table 1. Variables description

Independent variables	Description
DFL	the percentage change in earnings available to common stockholders associated with a given percentage change in earnings before interest and taxes
DOL	the percentage change in operating income (or earnings before interest and taxes) that results from a given percentage changes in sales
Business risk	the covariance of the sales in dollar multiplied by the net profit margin at t-1 with the expected rate of return on the market portfolio, divided by the variance of the return on the market portfolio
Dependent variable	**Description**
Excess return	the net income of the firm i at time t minus the rate of return on a risk-free asset multiplied by the value of equity of the firm i at time t-1

Approaching and Analysis Method

According to research theory, two main kinds of research approaching are deductive and inductive. In this study, I form up the research objections from the existing theory CAPM and Slim Abid and Mseddi (2004) model, which have been developed years ago and test it in Iran condition. Hence, in this case the deductive approaching is an appropriate way to test the specific hypotheses and answer the research questions. Besides, a quantitative approach is an appropriate way in this study since it refers to the systematic empirical investigation by using statistical, mathematical models. Moreover, quantitative method is used to validate hypotheses if they are true or not. Almost conclusion withdraws from the results of analysis using basic descriptive statistics and multiple regression analysis.

After the step of data collection, we conducted a statistical analysis of the data by using E-views software.

For investigating the impact of risks on firm value and calculating variables we have used Slim Meddi and Fathi Abid [1] model which is extrapolated from CAPM theory.

The flowing notation will be used through this model:

$S_{i,t}$ **:** the sales revenue of the firm i at time t,

$EBIT_{i,t}$ **:** the earnings before interest and taxes of the firm i at time t,

$NI_{i,t}$ **:** the net income of the firm i at time t,

DFL **:** the degree of financial leverage of the firm i.

DOL **:** the degree of operating leverage of the firm i.

$R_{i,t}$ **:** the rate of return on common stock i for the period from t-1 to t,

$R_{m,t}$: the rate of return on the market portfolio for the period from t-1 to t,

R_f **:** the rate of return on a risk-free asset,

$V_{i,t-1}$ **:** the value of equity of the firm i at time t-1,

Under Modigliani and Miller economic conditions the rate of return on common stock *i* for the

Period from *t-1* to *t* is defined as follows:

$$R_{i,t} = \frac{NI_{i,t}}{V_{i,t-1}} \qquad (1)$$

According to the Capital Asset Pricing Model (CAPM), the one period rate of return on Common stock *i* for the period from *t*-1 to *t* is defined by:

$$R_{i,t} = R_f + (E(R_{i,t}) - R_f)\frac{Cov\,(R_{i,t}, R_{m,t})}{V(R_{m,t})} \quad (2)$$

Substitution of equation (1) into equation (2) yields:

$$\frac{NI_{i,t}}{V_{i,t-1}} = R_f + (E(R_{m,t}) - R_f)\frac{Cov\left(\frac{NI_{i,t}}{V_{i,t-1}}, R_{m,t}\right)}{V(R_{m,t})} \quad (3)$$

Equation (3) can be rewritten as follows:

$$\frac{NI_{i,t}}{V_{i,t-1}} = R_f + \frac{1}{V_{i,t-1}}\left(E(R_{m,t}) - R_f\right)\frac{Cov(NI_{i,t}, R_{m,t})}{V(R_{m,t})} \quad (4)$$

The value of the firm can be expressed by:

$$V_{i,t-1} = \frac{NI_{i,t} - (E(R_{m,t}) - R_f)\frac{Cov(NI_{i,t}, R_{m,t})}{V(R_{m,t})}}{R_f} \quad (5)$$

The excess of return in dollar is given by the equation (6)

$$NI_{i,t} - R_f V_{i,t-1} = \left(E(R_{m,t}) - R_f\right)\frac{Cov(NI_{i,t}, R_{m,t})}{V(R_{m,t})} \quad (6)$$

Solving for the covariance operator:

$$\mathrm{Cov}(NI_{i,t}, R_{m,t}) \quad (7)$$

We define DOL and DFL as measures of the degrees of operating and financial leverages

Respectively. The degree of financial leverage (DFL) is defined as the percentage change in earnings

Available to common stockholders associated with a given percentage change in earnings before

Interest and taxes. The degree of operating leverage (DOL) is defined as the percentage change in operating income (or earnings before interest and taxes) that results from a given percentage changes in sales. Financial leverage reflects the amount of debt used in the capital structure of the firm, but operating leverage measures the effect of fixed cost. Mathematically, DFL and DOL can be calculated by using equations (8) and (9).

$$\mathrm{DFL} = \frac{Percentage\ change\ in\ NI}{Percenatge\ change\ in\ EBIT} = \frac{\frac{NI_{i,t}}{NI_{i,t-1}} - 1}{\frac{EBIT_{i,t}}{EBIT_{i,t-1}} - 1} \quad (8)$$

Thus equation (8) can be rewritten as follows:

$$\frac{NI_{i,t}}{NI_{i,t-1}} - 1 = \mathrm{DFL} * \left(\frac{EBIT_{i,t}}{EBIT_{i,t-1}} - 1\right) \quad (9)$$

DOL is defined as follows:

$$\mathrm{DOL} = \frac{Percentage\ change\ in\ EBIT}{Percenatage\ change\ in\ sales} = \frac{\frac{EBIT_{i,t}}{EBIT_{i,t-1}} - 1}{\frac{S_{i,t}}{S_{i,t-1}} - 1} \quad (10)$$

From equation (10) it follows:

$$\frac{EBIT_{i,t}}{EBIT_{i,t-1}} - 1 = \mathrm{DOL} * \left(\frac{S_{i,t}}{S_{i,t-1}} - 1\right) \quad (11)$$

Substitution of equation (10) into equation (8) yields:

$$\frac{NI_{i,t}}{NI_{i,t-1}} - 1 = \mathrm{DFL} * \mathrm{DOL} * \left(\frac{S_{i,t}}{S_{i,t-1}} - 1\right) \quad (12)$$

Percentage Change in Net Income is an Increasing Function of Financial Risk, Operational Risk and Sale Changes.

We can rearrange equation (7) by multiplying the first argument of the covariance by

$$\mathrm{Cov}\left(NI_{i,t} * \frac{NI_{i,t-1}}{NI_{i,t-1}}, R_{m,t}\right) = NI_{i,t-1} * \mathrm{Cov}\left(\frac{NI_{i,t}}{NI_{i,t-1}}, R_{m,t}\right) \quad (13)$$

Subtracting a constant equal to –1 from the first argument of the covariance term.

Can be rewritten as follows:

$$\mathrm{Cov}(NI_{i,t}, R_{m,t}) = NI_{i,t-1} * \mathrm{Cov}\left(\frac{NI_{i,t}}{NI_{i,t-1}}, R_{m,t}\right) = NI_{i,t-1} * \mathrm{Cov}\left(\frac{NI_{i,t}}{NI_{i,t-1}} - 1, R_{m,t}\right) \quad (14)$$

Substituting equation (12) into equation (14), we obtain:

$$\mathrm{Cov}(NI_{i,t}, R_{m,t}) = NI_{i,t-1} * \mathrm{DOL} * \mathrm{DFL} * Cov\left(\frac{S_{i,t}}{S_{i,t-1}} - 1, R_{m,t}\right) \quad (15)$$

Chung [3] showed that DOL and DFL are not random

Variables. Thus equation (15) can be rewritten as follows:

$$\mathrm{Cov}(NI_{i,t}, R_{m,t}) = \mathrm{DOL} * \mathrm{DFL} * Cov\left(\frac{NI_{i,t-1}}{S_{i,t-1}} * S_{i,t}, R_{m,t}\right) \quad (16)$$

Substitution of equation (16) into equation (6) yields:

$$NI_{i,t} - R_f V_{i,t-1} = \left(E(R_{m,t}) - R_f\right) * \mathrm{DOL} * \mathrm{DFL} * \frac{Cov\left((NI_{i,t-1}/S_{i,t-1} * S_{i,t}, R_{m,t}\right)}{V(R_{m,t})} \quad (17)$$

RESULT

Descriptive statistics provides simple summaries about the sample and about the observations that have been made. Such summaries may be either quantitative, i.e. summary statistics, or visual, i.e. simple-to-understand graphs. These summaries may either form the basis of the initial description of the data as part of a more extensive statistical analysis, or they may be sufficient in and of themselves for a particular investigation. IN this study we have used multiple regression in order to test hypothesizes. Summary of description statistics of all variables are included in the following table.

Table 2. Summary of description statistics of variables

Independent Variables	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Skewness**	**Kurtosis**
DFL	450	-79.389	127.2929	1.5210	10.5673	4.645838	68.87408
DOL	450	-65.5038	555.6961	3.6052	34.3677	12.15038	176.9476
Business risk	450	-5.3892	9.2930	0.0311	0.9522	3.13177	41.52423
dependent Variable	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Skewness**	**Kurtosis**
Excess return	450	-6.5196	0.6831	-0.0368	0.3363	-8.986207	112.6576

Multiple regression Analysis

The results from the linear regression model enabled the measurement of the relationship between dependent variable and several independent variables and test the hypotheses that were deducted earlier from the theoretical framework of this study. If the null hypothesis is rejected, the test gives sufficient statistical evidence that the relationship between dependent and independent variables is significant. On the other hand, if a null hypothesis is not rejected, the relationship between the studied variables is influenced by other factors than those that have been suggested. In order to determine whether one should reject or confirm the null hypothesis we have looked at the p-values that point the significance of the relation.

As Saunders et al. have argued, that it is very difficult to obtain a significant t-statistics with a small sample size. However, the impact of the sample size decreases when more than 30 observations are included in the study. In current study there are 450 cases.

Table 3. Regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
constant	-0.0574	0.017627	-3.2555	0.0012
DOL	0.0012	0.000556	2.1605	0.0314
DFL	-0.0006	0.001797	-0.3602	0.7189
Business risk	0.2343	0.07749	3.0233	0.0027

Hypotheses Testing

Testing the association between DOL with excess return (H1-1)

We investigate this claim that there is a significant relationship between DOL and excess return of companies. For this purpose, we estimate the model in which, excess return is dependent variable and operational risk of company is independent variable.

Multiple regression method was used to test this hypothesis. Results of regression analysis on variables are presented in table3.

The estimation of regression model by PLS indicates that the model is accepted at 95% level of Confidence. As regression results shows (P-value < 0.05), the H0 is rejected and H1-1 is accepted, so there is a significant association between DOL and excess return.

In this regression model, the calculated coefficient for DOL shows that it is correlated with Excess return positively.

Testing the association between DFL with excess return (H1-2)

We investigate this claim that there is a significant relationship between DFL and excess return of companies. For this purpose, we estimate the model in which, excess return is dependent variable and financial risk of company is independent variable.

Multiple regression method was used to test this hypothesis. Results of regression analysis on Variables are presented in tables3.

The estimation of regression model by PLS indicates that the model is accepted at 95% level of Confidence. As regression results shows (P-value > 0.05), the H0 is not rejected, so there is not a significant association between DFL and excess return.

Testing the association between business risk with excess return (H1-3)

We investigate this claim that there is a significant relationship between business risk and excess return of companies. For this purpose, we estimate the model in which, excess return is dependent variable and business risk of company is independent variable.

Multiple regression method was used to test this hypothesis. Results of regression analysis on Variables are presented in tables3.

The estimation of regression model by PLS indicates that the model is accepted at 95% level of Confidence. As regression results shows (P-value < 0.05), the H0 is rejected and H1-1 is accepted, so there is a significant association between business risk and excess return.

In this regression model, the calculated coefficient for business risk shows that it is correlated with Excess return positively.

CONCLUSION

In this paper we tried to investigate the relationship between firm value and risk according to the CAPM theoretical framework and the model which was developed by Slim Abid and Mseddi (2004) and Molaei, Maleki, Tutunchi, and Moghadam (2016) in Iran condition. Three measures of

risks were used, degrees of financial and operating leverages and intrinsic business risk. Using a panel of 90Iranian non-financial listed companies for the period from 2010 to 2014, our results corroborate those of Beaver and Manegold (1975), Chung (1989), Campbell, Polk, and Vuolteenaho (2009), Bhatti, Majeed, Rehman, and Khan (2010) and Li, Sullivan, and Garcia-Feijóo (2016) in that return in excess is a positive and increasing function of systematic and unsystematic risk for target population that exhibit a positive correlation between degree of operating leverage and intrinsic business risk with excess return. Our results are consistent with the hypothesis of positive relationship between operating and business risks with the firm value and inconsistent with the hypothesis of positive relationship between financial leverage with firm value. We have utilized the assumptions of the capital asset pricing model and many of these assumptions are obviously violated in the real world (e.g., homogeneous expectations). However, as Fama (1968) has pointed out, the assumptions of the capital asset pricing model are sufficient but may not be necessary. The violations which we observe do not necessarily negate the theory(Barth & Schipper, 2008). Finally, the distinction between a theoretical model and the results of an empirical test of the model must be kept in mind. For example, empirical tests have generally shown an association between unsystematic risk and business risk with firm value which is according to CAPM model but does not show any relationship between DFL and excess return which is against CAPM theory in Iran context. This distinction could be simply because of sampling method or population condition. However, study results indicate that investors take DOL and business risk in to account when valuing firms. The beta coefficient is a key parameter in the capital asset pricing model (CAPM).

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