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A study on the relationship between capital structure and the performance of production market: A case study of firms listed on Tehran Stock Exchange

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A B S T R A C T

One of the most complicated and challenging issues in today's financial managers is the relationship between the components of capital structure in terms of bonds and shares used for financing and share price of their company, and its effects on the macroeconomic variables. This research aims to study the relationship between the capital structure and performance of the production market in some firms listed on Tehran Stock Exchange (TSE). In this research, the index of capital structure is debt ratio and that of production market performance is sales growth and return of assets (ROA). The statistical sample of this research includes 128 companies, which have been active in 11 various industries and listed on TSE over the period 2005-2010. The statistical techniques used to test the hypotheses of this research include correlation coefficient and pooled least squares regression (panel data). Based on the results of our survey, there is a strong and significant relationship between debt ratio and return on assets among the companies listed on TSE and most industries especially based metals at the confidence level of 95%. In contrast, there is no strong and significant relationship between debt ratio and sales growth in the above-mentioned companies and in most industries.

1. Introduction

The industrial and financial economists have found increasingly that the capital structure of a company might be associated with the behavior of its production market (Brander & Lewis, 1986; Showalter 1995 – 1999). Many also have found that the financial activities of firms may not be performed necessarily internationally, rather domestically based on the culture of the related country, its legal system, institutions, and progress phases (Brander, 2007). Therefore, there are some attempts to analyze the special effects of a country on the relationships between the performance of production market and financial leverage. Opler (1994), Titman (2003), and Campello (2006 & 2007) conducted various studies on the impacts of the performance of production market on debt. In this research, we continue the works presented by Campello (2006) on the relation between production market and

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capital structure in a developing country, i.e. Iran. Decisions on financing and investment of companies are made foresightedly. The financing sources of companies are classified into two groups of internal and external financial sources based on their financing policies. In internal financing method, companies constitute their financial source out of their earned profit based on external financing method, out of debts and shares.

Companies issue securities normally in two types of debt and equity securities, and it is required to know that the most risky securities are debt securities, since the issuing company is required to pay its debt together with its interests at the maturity date. In case of failure in meeting the obligation in a timely manner, the company may be forced to dispose its assets. Moreover, equity securities (ordinary shares) are less risky for the company, since the company is not required to repay the dividends at the maturity date, and it can pay the dividends after meeting obligations. Therefore, the question is how companies can finance to influence the profit, return on equity, and sales, positively.

There are various factors including the nature of activities, assets, and type of industry, which influence the financing of a company. For instance, the nature of the activities conducted in a company may be so that allows to manage business based on cash flows. In such circumstances, the use of debts instead of shares (financing by debts) costs less money than shares do, and it boosts the profits of the company.

2. Theoretical framework and review of literature

The theory we are most closely testing is based on the work by Brander and Lewis (1986), where it tries to investigate the relationship between financial decisions and product-market decisions. Previous literature had analyzed these decisions separately by assuming an oligopolistic market, Brander and Lewis demonstrated (1986) that a limited liability firm that uses debt may choose to trade more aggressively by increasing its output. Such a strategy increases returns for shareholders when the firm is doing well. When the firm is doing poorly, shareholders are indifferent because debt holders have the prior claim on the firm’s assets in the event that the firm becomes bankrupt. Subsequent theory extends and in some cases contradicts the findings of Brander and Lewis. For instance, Bolton and Scharfstein (1990) argued that a firm that relies too much on external financing would become more vulnerable on markets fluctuations. The firm may, therefore, choose to employ internal sources of financing. Chen et al. (2007) argued that firms, which delay the introduction of products, and are more indebted than industry rivals, will be placed at a competitive disadvantage. Key empirical papers by Chevalier (1995a, b), Phillips (1995), and Kovenock and Phillips (1995, 1997) tended to contradict Brander and Lewis. Chevalier (1995a, b) examined some evidence from the American supermarket industry in the 1980s. They reported that announcements of leveraged buyouts (LBOs) by supermarkets could increase the expected returns of rival firms in the same locality and encourage entry and expansion by rivals. There is also a higher probability that a firm will exit its local market following its LBO if prices fall. Phillips (1995) examined four United States industries and reported mostly that higher leverage encourages firms to undertake fewer investment opportunities and to behave less aggressively. Kovenock and Phillips (1995, 1997) demonstrated that firms in highly concentrated industries that increase their debt are more likely to close down plants and reduce plant investment. If the market share of these leveraged firms is high, rival firms are less likely to close plants. When firms are highly leveraged, rival firms are also more likely to increase their investment.

Other aspects of product markets may be associated with leverage. For instance, Low and Chen (2004) found that product diversification allows firms to implement more leverage, because it lowers their exposure to risk. Characteristics of debt may also be associated with product market behavior. For example, Glazer (1994) argued that the way firms compete in product markets depends on whether they were using long-term debt, short-term debt, or no debt. The author stated that if firms are competing on the basis of output, the use of long-term debt would tend to encourage collusion between the firms.

Apart from the various results on the predicted relationships between leverage and product market-competition and performance, important methodological issues have arisen in the literature. Zingales (1998) stated that efficient trucking firms are more likely to survive deregulation of their industry. Firms that under-invest because of higher leverage are less likely to survive. As in previous studies, Zingales employed regression analyses to test the relationship between debt and product-market competition. However he claimed that his results were more robust than those presented by Chevalier (1995a, b), Phillips (1995), and Kovenock and Phillips (1997). In these studies, it is possible that a firm's financing choices are made in anticipation of their impact on its competitive position. Therefore, it is difficult to determine whether financing choices impact a firm's competitive position or vice versa. The causal relationship is clearer in Zingales, because deregulation was an external event that unexpectedly affected competition and capital structure choices in the trucking industry. Istaitieh and Rodriguez (2002, 2003) implemented a simultaneous regression equations model to deal with the issue of cause and effect. In one equation, debt is the dependent variable, while product market factors are included as independent variables. In the other equation a key product market factor is specified as the dependent variable and debt is included as one of the independent variables. Using data from Spanish manufacturing firms, the authors find that industry concentration and product market competition both influence and were influenced by leverage.

Our paper's empirical model is most similar to that of Opler and Titman (1994) and Campello (2003, 2006, 2007), in that it examines the relationship between a firm's capital structure and its performance, relative to the performance of its competitors in the same industry. Opler and Titman (1994) looked at the relationship between financial distress and corporate performance. They found that during recessions, highly indebted firms lose business to their less indebted rivals. Highly leveraged firms that spend significant amounts of money on research and development are more liable to lose market share during difficult economic periods. This is because such firms are producing specialized products, and this makes them particularly susceptible to financial distress. Campello (2003) found that during economic downturns, highly indebted firms experience a significant decline in their sales growth in industries in which their competitors are less indebted. This outcome is not observed if all firms in an industry are highly leveraged. Campello believed his study was the first to find evidence of a relationship between capital structure, product markets and business cycles, and that the evidence indicates that capital structure systematically affects firms' performance in the marketplace. Campello (2006) found that firms with significantly higher long-term debt than the industry average could experience sales growth as they take on debt at the margin. However, firms with very high levels of debt in comparison to the industry standard may experience no gains in market share, or even losses. The study also found that market leader firms in concentrated industries did not do as well as their competitors when their debt levels exceed the industry average. In the same industries, less indebted leader firms increase their market share as they take on more debt. Campello (2007) found that when a firm's investments were funded with debt and the firm's assets are observed to be more tangible after the debt has been raised, the firm's product-market performance is better than that of its rivals. Namazi and Shirzadeh (2005) stated in their studies that there was in general a positive relationship between capital structure and return on assets of companies, but such a relationship was statistically weak. As the relation between capital structure and capital depends on the type of industry, therefore, the optimal structure should be searched among different industries.

The results of the studies of Norawesh and Yazdani (2010) showed that there was a significant and negative relationship between leverage and investment. Moreover, the results confirmed that the relationship between leverage and investment in companies with lower growth opportunities was stronger than that in the companies with higher growth opportunities.

3. Research Hypotheses

Main Hypothesis

There is a relationship between capital structure and production market.

Sub Hypotheses

Hypothesis 1: there is a relation between debt ratio and sales growth.

Hypothesis 2: there is a relation between debt ratio and return of equity (ROA).

3.1. Statistical population and research sample

The statistical population of this research consists of the companies listed on TSE over the period 2005-2010 with following conditions:

1- The companies had been listed on the stock exchange from 2005 to 2010.

2- Their fiscal year ended to March 14 of each year.

3- Their activity was not of investment type.

4- Their fiscal information for the period from 2005 to 2010 was provided completely.

Based on the above-mentioned conditions, 216 companies were considered as qualified for this research, and according to the sampling calculations, 128 companies were sampled. For the purpose of stratified random sampling or stratification, samples were taken from each stratum by drawing lots using domain of numbers or defined codes, to select the members corresponding to the allotted code in each stratum. In conclusion, the members of the sample were selected from the different industries.

3.2. General Method of Research

This is an applied research in terms of objective and used an ex post facto method for its design, and an inductive- descriptive technique for the collection of data and inference.

3.3. Data Collection Techniques

For the collection of data based on library method, foreign and domestic researches published in books, papers, and dissertations were used. The information of the researched companied were collected from the information published by Tehran Stock Exchange and its internet site www.rdis.ir.

3.4. Statistical Methods

In this research, two statistical methods have been applied:

Descriptive Method: at first, numerical characteristics and ratios are used to describe the sample or statistical population demographically. Thereafter, main variables are described using scatter diagram and numerical characteristics (such as mean, variance, standard deviation, skewness, kurtosis, maximum, and minimum).

Analytical Methods: the following methods are used in two parts. At first, the presumptions of multivariate linear regression set forth in the following are evaluated, to find out if:

- The coefficient of determination tends to zero,
- The data of the research are normal according to the Kolmogrov - Smirnov test.
- The linear independence of independent variables is conducted by Pearson correlation test.
- The data are not auto-correlated according to Durbin-Watson test and LM test.
- The homogeneity of variances is evaluated by White test.

In the second phase, the significance of the correlation coefficient equation and its parameters is tested. For this purpose, the linearity and correlation tests are conducted.

3.5. Research Model

$Y = f(x_1, x_2, x_3, x_4, x_5)$

Y = dependent variable $= Y_{it}$

Dependent variable: debt ratio = total debt/total assets

x_1 = first independent variable = sales growth

Sales growth:

changes in the sales of company (sales of the year $_t$ – sales of the year $_{t-1}$)/sales of the year$_{t-1}$

x_2= second independent variable = ROA

Return on equity: the previous earnings before tax and interest (EBIT) divided by the book value of the assets.

x_3 = third independent variable = profit risk

Profit risk: average absolute value of EBIT/the standard deviation of EBIT

x_4= fourth independent variable: size of firm

Size of company: the natural logarithm of total assets at the end of the fiscal year

Table 1
The Variables and their Calculation Method

Variable	Symbol	Definition
Capital Structure	DR	Debt ratio = total debts/total assets
Return on Assets	ROA	EBIT/the book value of total assets
Sales Growth	SG	(the sales of the year$_t$ – the sales of the year$_{t-1}$)/sales of the year$_{t-1}$
Size of Firm	SIZE	LN (total assets)
Profit risk	RISK	The standard deviation of operating profit/book value of total assets

f = the mathematical relation between dependent variable (debt ratio) and independent variables x_1, x_2, x_3, x_4, and x_5. This relation is calculated using multivariate linear regression as follows (Fixed effect method):

$$Y_{it} = \alpha + \beta x_{it} + \varepsilon_{it}$$

4. Findings of Research

In this research, the statistical sample includes 128 companies for the period from 2005 to 2010. To test the hypotheses, the cross-sectional data and panel data are consolidated.

Table 2
Kolmogrov – Smirnov Test of the Research Logarithm

Research Variables	No.	Mean	Standard Deviation	Absolute Value of the highest Standard Deviation	Highest Positive Standard Deviation	Highest Negative Standard Deviation	Kolmogrov – Smirnov Test	Sig. Statistic
Debt Ratio	497	0.8746	3.43105	0.57	0.57	-0.43	1.274	0.081
Sales Growth	764	0.0203	0.53130	0.130	0.130	-0.085	3.607	0.1314
Return on Assets	757	0.0468	0.13474	0.075	0.075	-0.065	2.072	0.182
Profit Risk	512	0.587	2.71054	0.396	0.360	-0.396	8.954	0.074
Size	767	13.1194	1.48071	0.75	0.75	-0.61	2.088	0.141

Since the significance level (sig) for the logarithm of variables is greater than 5 % (and as the null hypothesis is rejected because the significance level is lower than 5 %), therefore, we conclude that the variables of this research are distributed normally. Pearson coefficient of the correlation between dependent and independent variables have been provided in the Table 3.

Table 3
The results of Pearson correlation ratios

		Lag volatility	size	Lag Sales growth	lag RoA	Lag debt
Lag volatility	Pearson Correlation	1.000000				
	Sig. (2-tailed)	.....				
	N					
size	Pearson Correlation	-0.021714	1.000000			
	Sig. (2-tailed)	0.6243				
	N					
Lag Sales growth	Pearson Correlation	-0.071325	0.069273	1.000000		
	Sig. (2-tailed)	0.1073	0.1178			
	N					
lag RoA	Pearson Correlation	0.000515	-0.268659	-0.006179	1.000000	
	Sig. (2-tailed)	0.9907	0.0000	0.8892		
	N					
Lag debt	Pearson Correlation	0.002507	-0.287013	-0.018856	0.899201	1.000000
	Sig. (2-tailed)	0.9549	0.0000	0.6707	0.0000	
	N					

The coefficient of correlation between the logarithm of the variables debt ratio and return on assets (ROA) is according to Table 3 is equal to 0.899. This means the relationship among these variables is strongly significant. As the significance level is lower than 5 %, therefore, this relationship can be generalized into the entire population. The positive coefficient confirms a direct relation.

The coefficient of correlation between the logarithm of the variables debt ratio and sales growth is in accordance to Table 3 is equal to 0.018. This means the significance of the relation between these variables is weak. As the significance level is higher than 5 %, this relation cannot be generalized to the whole population.

Table 4
The results of Pearson correlation ratios

Type of Industry			SG	ROA	NB
Automotive Industry	NB	Pearson Correlation	-0.096	-0.573**	1
		Sig. (2-tailed)	0.387	0.000	
		N	84	84	84
Pharmaceutical Industry	NB	Pearson Correlation	-0.040	-0.556**	1
		Sig. (2-tailed)	0.634	0.000	
		N	144	144	144
Food and Beverage	NB	Pearson Correlation	0.079	-0.246	1
		Sig. (2-tailed)	0.550	0.048	
		N	60	60	60
Base Metals	NB	Pearson Correlation	-0.071	0.790**	1
		Sig. (2-tailed)	0.609	0.000	
		N	54	54	54
Nonmetallic Minerals	NB	Pearson Correlation	0.169*	-0.327**	1
		Sig. (2-tailed)	.058	.000	
		N	137	138	138
Mining Industry	NB	Pearson Correlation	-0.247	-0.259	1
		Sig. (2-tailed)	0.146	0.127	
		N	36	36	36
Metallic Products	NB	Pearson Correlation	0.113	-0.433**	1
		Sig. (2-tailed)	0.512	0.008	
		N	36	36	36
Rubber Industry	NB	Pearson Correlation	.011	-.325*	1
		Sig. (2-tailed)	0.942	0.024	
		N	48	48	48
Electric Devices	NB	Pearson Correlation	-0.095	-0.531**	1
		Sig. (2-tailed)	0.375	0.000	
		N	90	90	90
Paper Industry	NB	Pearson Correlation	-.312	-.472*	1
		Sig. (2-tailed)	0.138	0.020	
		N	24	24	24
Miscellaneous	NB	Pearson Correlation	-0.123	-0.178	1
		Sig. (2-tailed)	0.375	0.199	
		N	54	54	54

Each industry was studied by Pearson correlation test. In this research, we have only provided the coefficient of correlation between the variables debt ratio, sales growth, and return on assets for the final analysis.

4.1. The Relation between Variables and Interpretation of Coefficients

In this section, the main model formed from dependent, independent, and control variables is provided, and it has been fitted by normal least squares and based on the type of the data, which is panel data.

Table 5
The results of regression analysis

Dependent Variable: debt ratio Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
constant	-0.155039	0.174112	-0.890453	0.3736
Sales growth	-0.024672	0.033607	-0.734121	0.4632
ROA	0.048701	0.001623	30.01429	0.0000
SIZE	0.000646	0.006874	0.093974	0.9252
volatility	-0.025332	0.013158	-1.925176	0.0548
R-squared	0.665735	Mean dependent var		-0.437305
Adjusted R-squared	0.663093	S.D. dependent var		0.723499
S.E. of regression	0.419946	Akaike info criterion		1.112354
Sum squared resid	89.23530	Schwarz criterion		1.153805
Log likelihood	-279.2064	Hannan-Quinn criter.		1.128604
F-statistic	251.9428	Durbin-Watson stat		1.110300
Prob(F-statistic)	0.000000			

$$Y = -0.155039 - 0.024672\, x_{1,i(t-1)} + 0.048701\, x_{2,i(t-1)} + 0.000646 x_{3,i(t-1)} - 0.025332 x_{4,i(t-1}$$

4.2. The Interpretation of Coefficients and the Results of the Estimated Model

The results obtained by the estimation of this model and other calculations and tests show that:

1- The statistic *t* and its probability (Prob.) confirm the significance of the linear relationship between debt ratio and return of assessment at the confidence level of 95 %.

2- The statistic R^2 indicates that 66 % of the changes in the dependent variables can be explained by the explanatory variable of the model. This proves that this model is considerably explainable.

3- The high value of the statistic *F* (251.9) indicates that the entire linear regression is significant. In other words, although F statistic is high, the significance level is lower than 0.05. As a result, the model can be generalized into the whole population.

4- The Durbin-Watson statistic in this model is equal to 1.11, and less than 2, therefore, the correlation between errors is rejected.

5- The coefficient of the variable ROA shows that and increase in the ROA by 1 unit, can increase the debt ratio by 0.04.

In the following table, the value of t for ROA is equal to 30.01429 and the Prob. less than 0.05, and these two values confirm that there is a significant relation between ROA and debt ratio at the confidence level of 95%. Therefore, the null hypothesis is rejected at the confidence level of 95%, and a significance relation in the model can be estimated. The statistic t for the coefficient of sales growth, however, is equal to – 0.734121, and its Prob. is greater than 0.05. Therefore, both values confirm that there is no significant relation between sales growth and debt ratio at the confidence

level of 95%. Thus, the null hypothesis is not rejected at the confidence level of 95%, and no significant relation can be estimated in this model.

4.3.The Relation between Variables of the Industrial Companies Listed on Tehran Stock Exchange

Table 6
Test of Homogeneity of Variances

	Leven statistic	df_1	df_2	sig
Lag RoA	28.050	10	757	0.000
Lag debt	44.430	10	757	0.000
Lag sales growth	3.540	10	757	0.000

Table 7
The results of ANOVA test

		Sum Of Squares	df	Mean Square	F	sig
Lag RoA	Between Groups	6113.876	10	611.388	6.423	0.000
	Within Groups	72058.903	757	95.190		
	Total	78172.778	767			
Lag debt	Between Groups	472868.519	10	47286.452	8.617	0.000
	Within Groups	4153893.6	757	5487.310		
	Total	4626758.2	767			
Lag sales growth	Between Groups	5.100	10	0.510	1.795	0.058
	Within Groups	214.831	756	0.284		
	Total	219.931	766			

To study whether the variables of return on assets, sales growth, and debt ratio depend on the type of industry, analysis of variance (ANOVA) has been applied. Considering that the significance value of the factor of industry for sales growth is equal to 0.058, we can conclude that the factor of industry is not effective in this variable. In contrast, the significance of the industry factor for sales growth is equal to 0.058 and it indicates that industry has no effect on this variable. Considering that, the significance of industry is lower than 0.05 in the variables of return on assets and debt ratio, therefore, the factor of industry is considered effective in these variables.

5. Conclusion

In this section, the information obtained from the previous sections are used to test the hypotheses, and provide the following conclusion.

Hypothesis 1: There is a relation between debt ratio and sales growth.

To evaluate the normality of the above-mentioned variables, the Kolmogrov-Smirnov test has been applied, and as the variables were not normal at first, the logarithm of the model was used.

In the study of the dependent variable debt ratio, the statistic t and its probability value (equal to 0.4632) show that there is no significant linear relation between this dependent ratio and sales growth at the confidence level of 95%. As the value of significance level F in this model is equal to 0.000, therefore, it is concluded that the linear regression is significant and can be generalized into the total population. Moreover, it can be concluded that the first hypothesis, i.e. the relation between debt ratio and sales growth, is rejected.

Hypothesis 2: There is a relation between debt ratio and return on assets.

To evaluate the normality of the above-mentioned variables, the Kolmogrov-Smirnov test has been applied, and as the variables were not normal at first, the logarithm of the model was used.

In the study of the dependent variable debt ratio, the statistic t and its probability value (equal to 0.000) indicate that the significant linear relation between debt ratio and return on assets can be generalized to the whole population at the confidence level of 95%. The coefficient of return on assets in the model is equal to 0.048701, and its shows that there is a significant and direct relation

between debt ratio and return on assets. The coefficient of determination (R2) obtained for this hypothesis is equal to 0.66, which indicates that 66% of the changes in the dependent variables can be explained by the explanatory variable of the model. It must be noted that this percentage confirms the high explain ability of this model. As the significance value F in this model is equal to 0.000, it can be concluded that the linear regression is of significance and the model can be generalized into the whole population. Considering the above-mentioned issues, it can be concluded moreover that the second hypothesis, i.e. the relation between debt ratio and return on assets, is confirmed.

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