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Market structure and capital structure

Abstract. One of the most important issues that financial economists have been addressing in recent years is identifying the relationship between market structure and financing decisions of companies or capital structure. This research is to identify the effect of the market structure on the capital structure. In this research, the market structure is meant the market power which has measured by using Tobin's Q ratio. To examine the relationship between two variables, 10 companies' data obtained from a 6-year period, and linear and nonlinear models have been used. The results achieved based on the linear model show that there is a significant positive relationship between the two variables. The nonlinear-driven results indicate that there is a significant negative relationship between these two variables in the low and upper levels of the market power. However, in the middle level of market power, the two variables are significantly and positively related; that is to say, there is third-order nonlinear relationship between the variables.

Keywords: market structure; capital structure; Tobin's Q ratio; market power; models

Introduction

In corporate finance, cooperation between Modigliani and Miller (1958, 1963) about lack of the relationship between capital structure and tax shield benefits led to making the way smooth in order to improve and develop other theories and a series of initiatives in empirical research related to capital structure. These theories include "equilibrium theory", "hierarchy theory or theory of information asymmetry" and "agency theory". Based on empirical tests in developed countries, especially in the United States, all these theories have been studied (Pandi, 2004).

In the multilateral monopoly structure of product market and favorable profitability conditions, companies implement a productivity-maximizing strategy to eliminate monopoly and to promote their

profitability, and thereby their debts would increase (Brander and Luis, 1986). This theory is used in unfavorable economic situations that cause companies stop production, and reduce their debts (Pandi, 2004). On the other hand, poor capital structure increases the probability of financial distress and bankruptcy. When the company is not able to pay their debts, it faces costs caused by financial distress, and in this case, if the company increases its debts to respond to the competition, it just makes the time of its bankruptcy short. As a result, reducing the debts, the company ensures its survival in the market (Scott, 1976). Therefore, companies' financing decisions vary regarding competitive conditions (Setayesh & Kargarfard Jahromi, 2011). Considering these given reasons, this study is to explore the relationship between market structure and capital structure using linear and nonlinear models.

Theoretical foundations

Brander and Lewis (1986) and Mcsymvyik (1988) have presented a theoretical framework that relates the capital structure to the market structure. Although the presumed target is to maximize profitability in industrial organizations, these theories are similar to those of corporate finance; so that it is assumed that the company's objective is to maximize shareholder wealth. In addition, the market structure has been shown to affect capital structure by influencing and competitive behavior and corporate strategies. While shareholders enjoy increasing wealth in the desirable terms, they intend to ignore decreasing profitability in the undesirable periods. This is because the undesirable consequences will be undertaken by the creditors due to the shareholders' limited liability. Therefore, as opportunities to earn more profit are developed, active firms in the oligopolistic market will create more debt to produce more as compared to those engage actively in a competitive market. An implicit forecast of the production-maximizing strategy is that the capital structure and market structure has a positive relationship (Pandi, 2004).

In corporate finance, the theory of agency costs supports using more debt, and this corresponds to forecasting production-maximizing strategy. Jensen and Mackling (1976) have argued when investing in risky projects, the conflict between shareholders and creditors causes the risk transfer from shareholders to creditors, and thereby this trend make the wealth allocation in favor of their own. Based on the product market decisions, the agent theory points out that companies will have got to borrow more for following the «Aggressive Production Policy» (increased production) that is beneficial for shareholders. However, another of the company's financial theories that justifies the using more borrowing is called "tax shield theory" (Modigliani and Miller, 1963). According to this theory, profitable firms are creating more debt to use tax benefits. It seems that maximizing production by companies active in the oligopolistic markets increases their profitability. Then, both the agency cost theory and the tax shield theory predict a positive relationship between capital structure and market structure.

Myers (1977) presented a model in which the debt leads to "under-investment" (asset substitution). In this scenario, the companies reject profitable and low-risk investment projects where the probability of the interests transfer from shareholders to creditors is very much likely to occur. In addition, due to information asymmetry, "internal financing" (financing through the internal resources) will be cheaper than that through debt or equity. For a leveraged firm, higher debt increased cost of production. In a competitive market, non-leveraged companies will intensify the competition by increasing production and/or reducing prices. If the leveraged companies continue borrowing to stay in the competition, they may face bankruptcy and financial pressure. Therefore, the theory of information asymmetry predicts a negative relationship between capital structure and market structure (Pandey, 2004).

Literature

Kryshnazevami, Mangla and Ratynazmi (1992) found a negative relationship between the capital structure and competition in the product market, and in their study, the competition in product market was calculated via the Lerner index. In contrast, Chevalier (1993) showed that there is a positive relationship between the capital structure and the competition in product market. Using Q-Tobin index, Barkley and Smith (1996) showed that there is a negative relationship between the market structure and capital structure, while Mykhalas, Chittenden and Potzyuris (1999) achieved a positive relationship using the Q-Tobin index.

In terms of using nonlinear models about the relationship between market structure and capital structure, Pandey (2004) concluded that there is a third-order non-linear and cube-shaped relationship between Q-Tobin index and capital structure. Using data from Chinese companies, Begun, Lee and Fairchild (2011) achieved the very result obtained by Pandey (2004). In the case of the relationship between capital structure and market structure in Iran, Setayesh and Kargarfard Jahromi (1390) showed that there is a significant positive relationship between the capital structure and Herfindal-Hirschman indices and Q-Tobin index (as measures of the competition in product market). But if the concentration ratio of four big industrial companies is used (as an index to measure the competition in product market), there is no significant relationship between the two variables. In their study, through a non-linear model, it was also showed that there is a cube-shaped relationship between the Q-Tobin index and capital structure. Additionally, Shahedani, Chavoshi and Mohseni (2012) showed that there is a cube-shaped relationship between the capital structure and Q-Tobin index. These results confirmed those of studies conducted by Pandey (2004), and also, Gani, Lee and Fairchild (2011).

Hypothesis

- First Hypothesis: There is a significant linear relationship between market structure and capital structure;

- Second Hypothesis: There is a significant non-linear relationship between market structure and capital structure.

Psychological Method

The current study in the words of Malcolm Smith (2003) the type of archive.

For the experiments it is necessary that the company's financial statements, data from existing sources and reports of stock securities should be collected. Eviews software Version 8 is used for collection of data from Tehran stock exchange official site and date base of Rah Award Nawin for analysis and required tests.

The scope of time, Years 1387 to 1392 and territory of locations are listed companies on Tehran stock exchange.

Following limitations have been applied for sampling.

- Financial year of the company should end at the end of Pisces each year;

- Should not the part of Banks, Insurance and investing companies;

- Necessary information should be available for measurements and other research variables.

Imposed limits randomly used from the information of 10 companies during 6 year (Companies 60 years), for the experiments of the hypothesis.

Variables

The Dependent Variable.

Dependent variable is the capital structure which is used to measure the ratio of total debt to total asset.

Independent Variable

The independent variable is a market structure; in this research purpose of the market structure is the potential of the market. Used to measure the ratio of the market value to the book value of total assets (Tobin Q's index).

Control variables

Control variables used are as follows:

Profitability: Total assets are calculated by dividing the net profit in this variable.

Model 1) $TDR_{i,t} = \alpha_0 + \alpha_1 Tobin\_Q_{i,t} + \alpha_2 ROA_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 GROWTH_{i,t} + \varepsilon_{i,t}$

Size: The natural logarithm of stock value has used from measurement of this variable.

Growth: The per cent change in sales of year t to year t-1 is used for the measurement of the company's growth.

Model 2) $TDR_{i,t} = \alpha_0 + \alpha_1 Tobin\_Q_{i,t} + \alpha_2 Tobin\_Q^2_{i,t} + \alpha_3 Tobin\_Q^3_{i,t} + \alpha_4 ROA_{i,t} + \alpha_5 SIZE_{i,t} + \alpha_6 GROWTH_{i,t} + \varepsilon_{i,t}$

Models for testing hypothesis

Model 1 is used for testing first hypothesis.

Model 2 is used for testing second hypothesis.

Symbols for model 1 and 2 are as follow:

TDR: Capital Structure.

Tobin Q: Tobin Q index is known as structure (Power) market.

ε: Model error.

$_n\alpha$: Coefficients.

i and t respectively, are the company's logo and year.

To justify non-liner relationship, Index of Tobin Q in term of power 2 and 3 are in model 2.

Findings

Descriptive statistics

Table 1 shows the descriptive statistics of the variable of the company annually. Coefficient variation of size variable is less than other variables which shows this variable is more stable than other variables in the company's studied year.

Table1

Descriptive statistics of variables

Coefficient of variations	Standard deviation	Minimum	Maximum	Middle	Average	Variable / Statistic
0/263	0/141	0/240	0/769	0/515	0/535	TDR
0/393	0/617	1/014	4/653	1/397	1/569	Tobin_Q
0/558	0/115	0/041	0/627	0/200	0/206	ROA
0/053	0/738	12/722	16/102	13/866	13/872	SIZE
2/183	0/668	-0/098	5/212	0/190	0/306	GROWTH

Stationary

Table 2. The result of the stationary variables shows. Except profitability variables which are stable at 5 % significance level, all other variables at significant level are stable at 1 %.

Table 2

Reliability result of the research variables

Test Levin, Lin and Chu		Test / Variable
Level of significant	Test Statistic	
0/0000	-4/998	TDR
0/0000	-4/373	Tobin_Q
0/0147	-2/187	ROA
0/0000	-520/395	SIZE
0/0000	-27/322	GROWTH

Correlation

Table 3. Correlation shows the spearmen between the variables. Except the correlation between growth variables and other variables also size variable and profitability, other coefficients are significant at 1 %.

Table 3

Correlation between research variables

	TDR	Tobin_Q	ROA	SIZE	GROWTH
TDR	1				
Tobin_Q	-0/51	1			
ROA	-0/80	0/75	1		
SIZE	-0/46	0/42	0/21	1	
GROWTH	0/13	0/20	0/05	0/15	1

F-Limmer tests and Hausman

Table 4. F-Limmer and Hausman tests for regression models 1 and 2 shows. According to significant level of F-limmer test it is clear that both models are the type of panel. And there is no need of test for determining the type of effects. Hausman test results shows that in both models, the null hypothesis based on superiority of the fixed effects on random effects cannot be ruled out.

Table 4

F-Limmer and Hausman test result

	F-limmer test	Hausman test	Result
	Significant level	Significant level	
Model 1	0/7088	0/0000	Panel model with random effects
Model 2	0/9546	0/0000	Panel model with random effects

Normality test of distribution of disruption

Table 5. Shows the test result of normality and distribution of disturbance for models 1 and 2.

About both models, according to statistics j-B are not significant and zero hypotheses are based on normality of distribution of disturbance.

Table 5

Normality test of distribution of disturbance

	j-B statistics	Significant level
Model 1	2/997	0/2235
Model 2	3/479	0/1756

Autocorrelation and dissimilar variance test

Although the possibility to test the autocorrelation by using Brash Godfrey test and the possibility to test the dissimilar variance for mixed data does not exist in Eviews software, autocorrelation test has done by the Dorbin Watson statistic (they will present in the following) and about the dissimilar variance test, according to the options in the software, estimation of the models done is such way that if there is a problem of the dissimilar variance it will be solved.

Test of Hypotheses

Table 6 shows the test of first hypothesis. F and its significant shows that model is significant in general. According to statistics of Dorbin Watson it's almost close to 2, with few exception we can say that problem of autocorrelation doesn't exist in distribution of disturbance at the first prayer. Adjusted coefficient of determination is equal to 75/0, means that 75 % of capital structure changes explain and made by market structure and model control variables. Coefficient index of Q-Tobin is positive and in level is 1 percent is significant which shows the confirmation in first research hypothesis based on the positive and significant relationship between market structure and capital structure. This result is consistent with the theory of the cost of representation and tax shield. Coefficient of control variables shows that capital structure has negative relationship with profitability and size but positive relationship with growth. And this relations in level is 1 % significant

Table 6

Test result of first hypothesis using random effects method

	Coefficient	Significant level	t statistic
Width from origin	1/475	0/0000	9/119
Tobin_Q	0/066	0/0000	4/963
ROA	-1/044	0/0000	-10/401
SIZE	-0/066	0/0000	-4/579
GROWTH	0/017	0/0056	2/885
Statistic F	45/285	0/0000	Significant level Statistic F
Adjust and determined coefficient	0/75	1/7	Durbin Watson statistic

In table 7 the result of second hypothesis shows. F statistic and its significant show that this model is generally significant. According to statistics of Durbin Watson which is almost equal to 2, we can say that the problem of autocorrelation does not exist in the first level of disturbing elements. Adjusted determined coefficient is equal to 0/80; this means that 80 % of the capital structure model is explained by market structure and control variables. According to coefficient index of Q Tobin, the each power of 2 and 3 is also significant; the second research hypothesis is based on the existence of significant nonlinear relationship between market structure and capital structure confirmed in10 per cent level. Actually result shows that in upper and lower levels of market structure, relation between market structure and capital structure is negative, but in the middle level of market structure is positive. This result means that in different competitive conditions, relation between market structure and capital structure can be different. Coefficients of controlled variables show that capital structure with profitability and size variables has negative relation. But with growth variables has positive relationship. And these relations are significant in level 1.

Table 7

Result of second hypothesis test using random effects method

	Coefficient	Significant level	t statistic
Width from origin	1/781	0/0000	8/270
Tobin_Q	-0/226	0/0977	-1/686
Tobin_Q^2	0/158	0/0047	2/948
Tobin_Q^3	-0/022	0/0013	-3/408
ROA	-1/212	0/0000	-12/810
SIZE	-0/069	0/0006	-3/630
GROWTH	0/017	0/0056	2/890
t statistic	41/364	0/0000	Significant level F statistic
Adjust determined coefficient	0/80	2/02	Durbin Watson statistic

Conclusion

Various theories exist about the relationship between market structure and capital structure.

In fact some of the theories predict positive and some predict the negative relationship between market structure and capital structure. The result of experiment research is also the same this is due to intricate relationship in the market.

Q Tobin index is used in the research as criterion of market structure which shows the result of significant and positive linear relationship between market structure and capital structure. This result is similar to findings of Mykhalas, Chetandan and Potez yories (1999), Setayesh and KARGARFARD JAHROMI (1390), as well as Gaani, Lee and Fairchild (2011).

According to various theories on the relationship between capital structure and market structure, Pandi (2004) predict that nonlinear relationship exists between two variables. Therefore, nonlinear relationship between two variables is investigated and the result shows the nonlinear relationship, regarding the type of relationship at different levels of the market structure is different from previous research.

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Структура рынка и структура капитала

Аннотация. Одним из наиболее важных вопросов, которым в последние годы занимаются финансовые аналитики, является определение взаимосвязи между структурой рынка и финансовыми решениями компаний или структурой капитала. Данное исследование направлено на установление степени влияния структуры рынка на структуру капитала. В этом исследовании структура рынка подразумевает рыночную власть, которая измеряется с использованием коэффициента Q Тобина. Для изучения взаимосвязи между двумя переменными использовались данные 10 компаний, полученные за 6-летний период, и линейные и нелинейные модели. Результаты, полученные на основе линейной модели, показывают, что между этими двумя переменными существует значительная положительная связь. Результаты, основанные на нелинейности, показывают, что между этими двумя переменными существует значительная отрицательная связь на низком и верхнем уровнях рыночной власти. Тем не менее, на среднем уровне рыночной власти две переменные значительно и положительно связаны; т. е. существует нелинейная зависимость третьего порядка между переменными.

Ключевые слова: структура рынка; структура капитала; коэффициент Q Тобина; рыночная власть; модели; линейная связь; нелинейная связь

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