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The Study of Relationship Between Financial Leverage and Liquidity in Listed Firms of Tehran Stock Exchange

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Abstract
Capital structure decisions have been one of the most important issues of the corporate finance literature. Theoretically, it is also expected that liquidity has an important effect on companies' capital structure. In this research, the casual relationship between financial leverage and liquidity was investigated using panel data in listed firms of Tehran Stock Exchange during 2006-2010. To do so, 108 listed firms of Tehran Stock Exchange were selected as the sample of the study and bid – ask spread has been used as a criterion for liquidity measurement. In addition, F and Hausman tests were applied to select the best model of the panel, fixed effects and stochastic data. The findings showed a significant relationship between financial leverage and liquidity in Tehran Stock Exchange. In other words, financial leverage has a reverse effect on liquidity and on the other hand, liquidity has a positive and direct effect on financial leverage.

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1. Introduction

Capital structure decisions have been one of the most important issues of the corporate finance literature. Researchers try to explain capital structure by two models of pecking order and static trade off. But, researchers declared that both the static trade off model and the pecking order model have serious problems (Fama and French, 2005). In the static trade off theory, firms pick target leverage by weighing the benefits and costs of an additional dollar of debt. The static tradeoff theory suggests that there is an 'optimal' capital structure for each firm, which trades off the tax benefits of debt against the increasing likelihood of financial distress as leverage rises (Jensen, 1986).

In the pecking order theory, the costs of issuing new securities dominate other considerations. These costs arise due to management possesses private information about the value of risky securities and uses this information when making issuing decisions. Due to these costs, firms use internal capital to finance new projects. When internal capital is not enough, firms must use loan and equity is issued as a last resort (Myers, 1984). No theory is capable of explaining all regularities in capital structure decisions. Previous researches have indicated that leverage is related to profitability, market-to- book, firm size, tangible asset, and industry leverage in a manner consistent with either one or the other theory.

As it is stated, the pecking order theory assumes that liquidity is an important determinant of firms' capital structure. Liquidity is important feature of financial markets, yet little is known about its evolution neither over time nor about their time-series determinants (Fama and French, 2005).

Some researchers have been done about the causal relation between liquidity and leverage such as the effect of liquidity on leverage in capital market of developed countries. In this paper, we not only show that capital structure affects liquidity, but liquidity has a significant impact on leverage in listed firms of Tehran Stock Exchange.

The remainder of the paper is organized as follows: Section 2 Relevant literature. Section 3 describes research methodology. The models and their variables are described in Section 4. Findings are given in Section 5, and Section 6 conclusion.

To determine the causality between leverage and liquidity, researchers first explore the effect of leverage on bid - ask spreads (proxy for liquidity). They then used an instrumental variables approach and perform two-stage least-squares estimation to capture the effect of liquidity on leverage. They found that capital structure influence liquidity. Specifically, as leverage increases, bid - ask spreads decrease and finally liquidity increases. They believed that debt reduces agency costs. In other words, managers who are responsible for meeting interest and principal payments of debt are forced to choose positive net present value projects. Their finding is also consistent with Amihud and Mendelson that managers' capital structure decisions reflect their concern that illiquidity reduces value (Amihud and Mendelson, 1989). They indicated that there is a significantly negative relation between liquidity and leverage, and suggested that firms with smaller spreads are more likely to issue equity than debt to raise money (Frieder and Martell, 2006).

The impact of the liquidity of a firm's assets on optimal leverage has been an important issue for many years. Some researchers predicted that asset liquidity increases optimal leverage (Williamson, 1988; Shleifer and Vishny, 1992), while others believed that its effect is negative or curvilinear. They said positive effect of asset liquidity on leverage relies on the idea that less liquid assets sell at higher costs,

which increases the costs of liquidation, bankruptcy, and debt. Therefore, Lower asset liquidity creates the need to reduce the probability of costly default by lowering the leverage. Yet models that predict a non-positive effect argue that lower asset liquidity makes it more costly for managers to expropriate value from bondholders. Thus, lower asset liquidity reduces the costs of debt, and as a result, companies use more debt (Morellec, 2001; Myers and Rajan, 1998). It is also believed that through his examination of the relation between the liquidity index and leverage, he found that the level of leverage is positively and significantly related to the liquidity index (Sibilkov, 2004).

Agrawal et al examined the relationship between Bid-Ask Spread and sales of informed investors. They believed when companies' situations become worse, awareness transaction of company increases and uninformed investors exit from their market. Also Market makers increase Bid-Ask spread in response to trade increasing probability using other variables for financial situation of companies and then they concluded that obviously companies which have financial problem, have more Bid-Ask Spread and gets this results after controlling the effective key factors and indicate that assets of stockholders can be decreased by bad financial situation (Agrawal et al; 2004). Douglas O. Cook a, Tian Tang Using two dynamic partial adjustment capital structure models to estimate the impact of several macroeconomic factors on the speed of capital structure adjustment toward target leverage. They found evidence that firms adjust faster toward target leverage in good states than bad one when states are defined by term spread, default spread, GDP growth rate, and market dividend yield. Their results also support the pecking order theory in that firms that are under-levered adjust faster than firms that are over-levered (O. Cook and Tian Tang, 2010).

Alexei V. Ovtchinnikov declared that deregulation significantly affects the firms' operating environment and leverage decisions. Firms experience a significant decline in profitability, asset tangibility and a significant increase in growth opportunities following deregulation. Firms respond by reducing leverage. Deregulation also significantly affects the cross-sectional relationship between leverage and its determinants. Leverage is much less negatively correlated with profitability and market-to-book and much more positively correlated with firm size following deregulation. These results are consistent with the dynamic tradeoff theory of capital structure. Also consistent with the dynamic tradeoff theory, the speed of leverage adjustment to optimal leverage increases significantly following deregulation (Ovtchinnikov, 2010)

Laura Frieder and Rodolfo Martell used a two-stage least squares analysis to explore the notion that these variables are jointly determined. Consistent with the idea that debt forces managers to make better investment decisions, they find that as leverage increases, equity bid-ask spreads decrease. Using the fitted values from our first-stage regression, results from the second-stage regression further imply that as liquidity decreases, leverage increases, which is consistent with the notion that managers rely on debt financing when the cost of equity financing increases. While controlling for the endogenous relationship between spreads and leverage greatly reduces the impact of spreads on leverage, results from our analysis suggest that a one standard deviation increase in spreads results in a 3 percent increase in leverage (Frieder and Martell, 2006).

Mortal examined the cross sectional relation between capital structure and liquidity and found that liquidity explains an economically significant part of that cross section. At the same time, there is good reason to believe that liquidity could

be affected after capital restructuring (Mortal, 2006).

Lipson and Moral examined the impact of liquidity on capital structure decisions. Firms that enjoy more liquid equity experience a lower cost of equity and may be more motivated to adopt more equity and less debt in their capital structure. Consistent with this notion, the empirical evidence demonstrates an inverse relation between liquidity and leverage. Their results are especially interesting because they examine firms in Thailand, where capital markets are less sophisticated than the U.S.A, bank loans more prevalent, and corporate ownership much more concentrated. In spite of these differences, they believed that firms in Thailand with more liquid equity are significantly less leveraged (Lipson and Moral, 2011)

Bharath et al document a link between liquidity and capital structure using an index that captures the market's perception of adverse selection risk. Prior research has linked adverse selection to liquidity (Bharath et al; 2008). Similarly, Loughran and Schultz found that urban firms are more likely to issue equity and have less debt in their capital structure and attribute this to a reduced level of information asymmetry since urban areas contain a large number of potential equity investors familiar with the firm. But Bharath et al considered liquidity broadly without a focus on its adverse selection component (Loughran and Schultz, 2008). Giannetti noted that leverage is higher in those countries where the stock market is less developed and attribute these differences to agency costs (Giannetti, 2003). Faulkender and Petersen noted that firms with access to public debt tend to have higher leverage (Faulkender and Petersen, 2006)

Lipson and Mortal examined the relation between equity market liquidity and capital structure. They found that firms with more liquid equity have lower leverage and prefer equity financing when raising capital. For instance, after sorting firms into size quintiles and then into liquidity quintiles, the average debt-to- asset ratio of the most liquid quintiles is about 38% while the average for the least liquid quintiles is 55%. Similar results are observed in panel analyzes with clustered errors and using instrumental variables (Lipson and Mortal, 2009)

Weston, Butler, and Grullon showed that the liquidity of a firm's equity affects the ease with which a company can raise external capital via a stock offering. Thus, it seems obvious that liquidity could directly affect a firm's capital structure, and the fact that it has received little attention as an explanatory variable is somewhat surprising (Weston, Butler, and Grullon, 2005)

2. Research Methods

According to the main objective of this research, that is to examine relationship between financial leverage and liquidity in Tehran Stock. It is determined that whether companies with lower spread have a higher financial leverage or not?

In order to answer to this question, the following hypothesis is tested:

There is a significant relationship between financial leverage and liquidity in listed firms of Tehran Stock Exchange.

The statistical population contains all listed companies in Tehran Stock Exchange during 2006 to 2010 with the following conditions:

1) Companies that they have been listed in Tehran stock exchange during 2006-2010.

2 Stop transactions of the companies haven't been more than 3 months over the research period.

3) The traded stocks have not been included banks, financial institutions, investment companies, holding, leasing companies and financial Intermediaries in Tehran Stock Exchange over these periods.

With respect to above limitations, the statistical population is to be 150 companies. The number of Sample companies determined by Cocran formula is to be 108 companies. The Cocran formula is computed as follow:

$$n = \frac{N * Z^{2}_{\alpha/2} * P_{\circ}(1-P_{\circ})}{(N-1)*\varepsilon^{2} + Z^{2}_{\alpha/2} * P_{\circ}(1-P_{\circ})} \quad (1)$$

Where n denotes sample size, N denotes statistical population, $z^2_{\alpha/2}$ denotes amount of Z for considered confidence level, ε denotes estimation precision, P_o denotes Successfulness and $1\text{-}P_o$ denotes unsuccessfulness.

In order to select sample size, consider P_o=0.5, α=0.05, ε=0.25 and the sample size is equal to 108. In other words, the sample size includes 108 companies.

$$n = \frac{150*(1.96)^{2}*0.5(0.5)}{149*(0.05)^{2}+(1.96)^{2}*0.5(0.5)} = 108 \quad (2)$$

The data are collected by Rahavard Novin and Tadbir Pardaz software. Excel and Eviews software have been used to estimate the descriptive statistics and statistical analysis. Bid-ask spread is used as a proxy for liquidity in this research. Finally Hausman test has been used for research models estimation

In this paper, Our goal is to test whether the role that leverage plays in determining liquidity has any relevance for the role that liquidity plays in determining leverage. For this purpose, we first employ firm-level fixed effects to regress spreads on market leverage, while controlling for lagged spreads, return volatility, size, profitability, trading volume and institutional holdings. In order to estimate the regression equations (1) and (2), panel data method is used. First, F-limer test is used to choose one of the methods of panel or pooling data and then the Hausman test was done to select one of the Fixed Effects and random effects.

After estimating Equation (1), we use the estimates from the first-stage regression in regression equation (2), which features leverage as the dependent variable. To do so, we use the fitted values as instruments for spreads. That is, we use the predicted value of bid-ask spreads from regression equation (1) and give it the role of an independent variable in regression equation (2). Then we test whether the role that leverage plays in determining liquidity has any relevance for the role that liquidity plays in determining leverage. Our measure of liquidity is bid–ask spread which is inversely related to liquidity. To examine the relationship between liquidity and firms leverage, we use the model of Frieder and Martell (2008). The model is as follows:

$$SPREAD_t = \gamma_t + \delta_1 * LEV_t + \delta_2 * \sigma^2_{Rt} + \delta_3 * ROA_t + \delta_4 * Ln(MKTCAP_t) + \delta_5 * VOL_t + \delta_6 * INST_t + \delta_7 * SPREAD_{t-1} + \eta_{1,t} \quad (1)$$

$$LEV_t = \alpha_t + \beta_1 * LEV_{t-1} + \beta_2 * \widehat{SPREAD}_{t-1} + \beta_3 * ROA_{t-1} + \beta_4 * \sigma^2_{CFt-1} + \beta_5 * SIZE_{t-1} + \beta_6 * MTB_{t-1} + \beta_7 * INST_{t-1} + \eta_{2,t} \quad (2)$$

Where LEV denotes market leverage which is equal to debts to market value of assets ratio, σ^2_{Rt} denotes annual volatility of daily returns, ROA denotes return on assets, MKTCAP denotes market capitalization, VOL denotes trading volume, INST denotes Institutional holdings which is the percentage of common outstanding shares held by the investment companies, banks and insurance companies, SPREAD denotes effective spreads, σ^2_{CF} denotes volatility of cash flows, SIZE denotes log of the book value of assets, MTB denotes market-to-book ratio of assets and $\widehat{SPREAD}$ In the second equation denotes fitted value of effective spreads. The following formula has been used to compute bid-ask spread:

$$BA_{it} = \frac{AP - BP}{\frac{AP + BP}{2}} \quad (3)$$

In which I denotes selected company to given period, BA denotes bid-ask spread, AP denotes Ask price and BP denotes Bid price.

3. Results and Discussion

Previous researches indicated that liquidity may effect on leverage. In this paper, Our goal is to test whether the role that leverage plays in determining liquidity has any relevance for the role that liquidity plays in determining leverage.

The regression equation (1) estimation result is presented in table (1). As it is shown in table (1), the F- limer test result indicates that panel data method should be used to estimate regression equation (1). The Result of Hausman test shows that Fixed Effects is more efficient than random effects. Therefore, the test supports the use of a fixed effects test.

Also, the model Coefficient estimation result indicates that those variables by significant coefficients have expected sign in common significant level of 5%. Based on table (1), there is a negatively significant relationship among leverage, market value of stocks, trading volume and bid-ask spread. But, there is a positive relationship between stock return and spreads. And the coefficients of leverage, market value and trading volume are -0.24, -.07 and -.07 respectively (see table (1)). It means that by increasing one unit in leverage, market value and trading volume are caused decreasing bid-ask spread. Although the coefficient of trading volume is negative, but its impact factor on bid-ask spread is meager.

The estimation result of equation(2) shows in table(2).The Hausman test is shown to be selected panel data estimation method by Fixed Effects test for estimation of regression equation(2). The model Coefficient estimation result indicates that the all variables by significant coefficients have expected sign in common significant level of 5%. As it is shown in table (2), spread and size have positive effect on financial leverage. But, return on asset and MTB have negatively significant on financial leverage.

Table (1): Results of Regression (1)

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	1.217525	0.108537	11.21764	0.000
LEV	-0.242769	0.024444	-9.931604	0.000
σ^2_{Rt}	0. 000529	0. 000078	6.772989	0.000
ROA	-0.00923	0.012298	-0.750505	0.4534
MKTCAP	-0.073561	0.00709	-10.3747	0.000
VOL	-0. 07	0. 03	-2.067293	0.0393
INST	-0.000177	0.000359	-0.492662	0.6225
$SPREAD_{t-1}$	-0.092016	0.027321	-3.367942	0.0008
Unweighted Statistics				
R^2	0.45			
F- statistic	3.04 (0.000)	Cross-sections included	108	
F test(F- limer)	2.15 (0.000)	Sample (adjusted)	2006-2010	
Hausman Statistic	121.6 (0.000)	Total panel observations	540	

Table (2): Results of Regression (2)

Variable	**Coefficient**	**Std. Error**	**the-Statistic**	**Prob**

C	0.420819	0.056477	7.451112	0.000
LEV(-1)	0.363648	0.037091	9.804291	0.000
SPREAD(-1)	0.047716	0.021928	2.176061	0.0301
ROA(-1)	-0.116201	0.038554	-3.013973	0.0027
CFT(-1)	0. 0000000002	0. 0000000001	1.610114	0.11
SIZE(-1)	0. 000005	0. 000002	2.489434	0.0132
MTB(-1)	-0.002022	0.001071	-1.887503	0.0598
INST(-1)	-0.001033	0.000758	-1.36195	0.1739
test statistics				
R^2	0.93			
F statistic	48.54 (0.000)	Cross-sections included	108	
F test(F- limer)	3.2 (0.000)	Sample (adjusted)	2006-2010	
Hausman statistic	144.3 (0.000)	Total panel observations	540	

The coefficients of bid-ask spread and size are -0.0477 and 0, 000005 respectively (see table (2)). It means that by increasing one unit in bid-ask spread and size in last year are caused increasing financial leverage. But the impact factor of size variable on leverage is meager. In contrast, the coefficients of return on assets and market to book value are 0.012 and 0.002 respectively (see table (2)). It means that by increasing one unit in return on assets and market to book value in last year are caused decreasing financial leverage

4. Conclusion

Based on the hypothesis, there is a negative relation between financial leverage and liquidity during 2006- 2010. But liquidity has positive and direct effect on financial leverage over the period. These results are consistent with Laura and Rodolfo (2006). Also the following results obtain about the control variables:

a) There is a negative and significant relationship between trading volume and bid-ask spread. This result is consistent with Chang (2007), Chang, Millicent, (2008) and Brown & A.Hillegeist (2006) and is not consistent with results of Branch and Fred (1997) and Hariss (1994) research.
b) Market value of equity has negative relationship with liquidity. This result confirm to results of researches like Ryan, H (1996), Kini O, Mian The (1995), Heflin & Shaw (2005) and Jacoby and Zheng (2010).
c) Return on asset has negative and significant relationship with financial leverage. This result is consistent with the results of Myers (1984).
d) Market to book value that is a proxy of growth opportunities of companies has the negative relationship with financial leverage. This result confirms the results of Ovtchinnikov (2010).
e) Firm size has positive and significant relationship with financial leverage that confirms the results of Ovtchinnikov (2010).
f) Institutional holdings (INST) and volatility of cash flows haven't significant relationship with financial leverage.

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Note 1. A Hausman test strongly rejects the null hypothesis that the coefficients estimated by the efficient random effects test is the same as those estimated by the consistent fixed effects test.