

The impact of capital structure on firm value of Vietnamese listed companies – a quantile regression approach

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Abstract

Although there are many studies proving the close relationship between capital structure and firm value, contradicting results show that this relationship depends on research methods or characteristics of businesses. Does the decision on capital structure in low-value firms have different influence compared to high-value firms? This paper overviews literature on the effect of capital structure on firm value, and provides an empirical study on non-financial listed companies on Vietnam's Stock market in the period from 2011 to 2017. By using quantile regression method based on the panel data from 446 companies with 3122 observations, the results show that leverage has a positive impact on firm value when it is low and a opposite effect when it is high. These findings suggest that low-value firms should raise capital by taking more debt, whereas high-value firms should raise capital by issuing more shares.

JEL classification: G32, G35, C26

Keywords: Capital structure, Firm value, Quantile regression

1. Introduction

Capital structure is a mix of various debt and equity capital maintained by a firm (Ross *et al.*, 2013). Debt provides tax benefits to firms. Nonetheless, debt puts pressure on firms because interest and principal payments are obligations. If these obligations are not met, firms may risk financial distress. Equity financing places no additional burden on a company but that the owners have to share ownership and work with others could lead to some conflict if there are differences in vision and ways of running the business. Therefore, capital structure decision is one of key decisions to be undertaken by every company at the time of raising their capital.

Since the Modigliani and Miller theory (1958), assessing the impact of capital structure on firm value has been a leading topic in economic literature. Some theoretical and empirical studies show that there is a positive impact of debt financing choices on firm performance (Chowdhury *et al.*, 2010; Berger and Bonaccorsi di Patti, 2006; Margaritis and Psillaki, 2010; Bui, 2016; Vo,

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2017), whereas others prove that the impact is negative (Masulis, 1983; Singh and Faircloth, 2005; Balakrishnan and Fox, 1993; Majumdar and Chhibber, 1999; Ghosh, 2008; Gleason *et al.*, 2000; King and Santor, 2008; Le, 2015; Zeitun and Haq, 2015; Dawar, 2014; Seetanah *et al.*, 2014). The paper shows that this ambiguity is largely due to the inappropriate least squares method employed in the literature. In Vietnam, even though there are many studies related to capital structure and its impact on firm value, the quantile regression estimator method has not been used thoroughly. Therefore, the author is given strong motivation to apply this method using data collected from Vietnam non-financial listed companies in recent years.

The contribution of this study is to employ the quantile regression estimator method for the investigation of the impact of capital structure on corporate value. To test potential differences in parameters between firms at different segments of the distribution of firm value variables (i.e. parameter heterogeneity), quantile regression is more appropriate because it enables us to examine the whole distribution of the firm value variables. Instead of focusing on a single measure of the central tendency of the distribution, we evaluate the relative importance of explanatory variables at different points of the firm value distribution. In this study, the quantile regression method allows to portray the relation between capital structure and what? for more successful and for less successful firms separately. The estimates of this method are considered robust in comparison with the inefficient estimates produced by standard least squares.

The study estimates quantile regression models based on a balanced panel dataset of 446 listed companies on Vietnam stock exchanges over the period of 2011-2017. To distinguish the impact of capital structure from that of other factors, the study selects a large set of control variables based on a comprehensive literature review. Our main findings about the relation between capital structure and firm value are: (i) a significantly positive relation among lower value firms and (ii) a significantly negative relation among higher value firms.

The remainder of the paper is organized as follows. The next section discusses literature review and advance a hypothesis. Section 3 outlines the methodology and data used. Section 4 reports the empirical results. Section 5 concludes the paper.

2. Literature review and hypothesis

2.1 Literature review

The capital structure of a firm refers to the combination of debt and equity capital which a firm uses in its operation. Capital structure theories explain the mix of debt and equity used by firms, determinants of capital structure and the relationship between capital structure and firm value.

Major theories underpinning this issue are Modigliani and Miller (MandM), agency cost, trade-off, pecking order and market timing theory.

Modigliani and Miller theory. Modigliani and Miller theory (1958) is based on restrictive assumption of a perfect capital market and states that capital structure is irrelevant. Firm value will be affected by its own assets, not by any mixture of debt and equity. Optimal

capital structure does not exist. Nonetheless, Modigliani and Miller (1963) explain that the high debt level in their capital structure leads to lower tax debts and more cash flow after tax, which might increase the market value. An optimal capital structure exists when the company balances the risk of bankruptcy with the tax savings of debt.

The agency theory. The agency theory was initially developed by Berle and Means (1932), which discover that managers pursue their own interest instead of maximizing returns to shareholders. Jensen and Meckling (1976) demonstrate that there are two kinds of agency costs. The agency cost of equity arises because of the difference of interest between shareholders and managers. The agency cost of debt is caused by different interests of shareholders and debt holders. Jensen (1986) claims that with high debt, managers are under pressure to invest in profitable projects to create cash flow to pay interest. In other words, debt has a positive effect on a firm's value.

The tradeoff theory. Myer (1977) explains that a firm will trade off the costs and the benefits of debt associated with tax savings and financial distress to create an optimal capital structure for maximizing firm value. If the leverage is increased and the tax benefits of debt increase as well, the cost of debt also goes up. This trade-off theory predicts that target debt ratios will vary from company to company. High target debt ratio should be applied in profitable companies with safe, tangible assets. In contrast, unprofitable companies having risky, intangible assets ought to rely primarily on equity financing (Kraus and Litzenberger, 1973).

The pecking order theory. According to the pecking order theory which is formalized by Myers and Majluf (1984), firms seeking to finance new investments follows following sequence: first internal funds, then debts issuance and finally equity issuance. Retained earning is better than outside funds and debt is better for firms than equity if firms need external funds. Issuing equity becomes more expensive as asymmetric information insiders and outsiders increase so that firms should issue debt to avoid selling under-priced securities. Moreover, transaction costs in obtaining new external funds are higher than the costs of obtaining internal funds. The pecking order theory predicts that the most profitable companies generally borrow less since they do not need outside money, not because of low target debt ratios. Less profitable companies issue debt because they need external funds for their investment projects. The theory does not deny factors such as tax savings and financial distress but it explains that these factors are less important than manager's preference for internal over external funds. In summary, this theory states that there is a negative relationship between leverage and firm value.

The market timing theory. The study of Baker and Wurgler (2002) states that managers are able to time the equity issues. Conditional on having financing needs, firms prefer external equity when the relative cost of equity is low and prefer debt otherwise. Therefore, this theory explains that capital structure decisions are influenced by market conditions and there are no optimal capital structures to maximize firm value.

Empirical studies. Regarding the empirical evidence, most studies agree that debt can influence firm value in several ways. Jiraporn and Liu (2008) use the data of 1,900 companies

listed on the NYSE, Amex and Nasdaq in 15 years from 1990 to 2004 and show an insignificant relationship between capital structure and firm value. The research of Ebaid (2009) for all companies listed on the Egyptian stock market and Phillips and Sipahioglu (2004) for 43 companies listed on the stock market in England also find that the capital structure is irrelevant to firm value.

Chowdhury *et al.* (2010) investigate the effect of capital structure on firm value for 77 non-financial listed companies from 1994 to 2003 in Bangladesh. By adding to the model different control variables such as earning per share, dividend payment ratio, state ownership, fixed assets turnover, liquidity, revenue growth rate, firm size, the study shows that there is a significant positive relationship between capital structure and firm value. Other studies have reported positive effects of capital structure on corporate value such as Berger and Bonaccorsi di Patti (2006), Margaritis and Psillaki (2010), Bui (2016), Vo (2017), Tran (2016).

Some empirical studies support the view that capital structure has a negative effect on firm value such as Masulis (1983) for companies listed on the stock market from 1963 to 1978 in the USA and Singh and Faircloth (2005) for 98 companies listed on the stock market from 1996 to 1999 in the USA. Singh and Faircloth (2005) argue that high debt ratio will reduce future investments and thus has a negative impact on firm value and future growth potential. Similar results are found in studies of Balakrishnan and Fox (1993), Majumdar and Chhibber (1999), Ghosh (2008), Gleason *et al* (2000), King and Santor (2008), Zeitun and Haq (2015), Dawar (2014), Seetanah *et al.* (2014) or Le (2015).

In addition, a number of studies simultaneously demonstrate both positive and negative effects of capital structure on firm value. Abor (2005) uses the least-squares regression method (OLS) with data from 22 listed companies during the period of 1998-2002 in Ghana and demonstrates the positive effect of short-term debt on firm value and the opposite effect of long-term debt on firm value. Weill (2008) uses the data of seven European countries and provides new evidence that the relationship between leverage and firm performance varies across countries. The results in Spain and Italy show a positive relationship but the results in Germany, France, Belgium and Portugal show the negative effect.

The different results suggest that using the least squares method to estimate the relationship between capital structure and firm value may be inappropriate. Therefore, the aim of this study is to investigate the impact of capital structure on firm value by using the quantile regression.

2.2 Hypothesis

The relationship between capital structure and firm value may depend on the current financial capacity of a firm. Higher value firms will be able to issue shares more favorably than lower value firms. On the contrary, firms with lower value should use debt financing as it is a safer and more suitable option. Therefore, by analyzing the firm value according to different quantiles, the hypothesis is as follows: Capital structure has a positive effect at the lower quantiles of firm value and negative effect on firm value at the higher quantiles of firm value. These are two separate hypotheses.

3. Methodology and data

3.1 Data

A panel of secondary annual data of Vietnamese listed firm's financial figures and stock prices from 2011 to 2017 is used in this research. The raw data are obtained from the Stoxplus Company, a nationally recognized company providing Vietnamese financial database. The data are cleaned by dropping observations missing main data or containing extreme data. In addition, financial institutions and insurance firms are excluded since the accounting presentations are different from those in other sectors. Following the above sample selection process, a total of 3122 observations are collected from 446 companies in 7 years. Table 1 shows the industry distribution of Vietnamese listed firms, based on Industry Classification Benchmark Code.

Table 1. Number of firms classified by industry

Industry	HNX	HOSE	Total	Min
	Number of firms	Number of firms	Number of firms	Proportion of firms (%)
Technology	13	8	21	4,7
Industrials	133	70	203	45,5
Oil and gas	2	1	3	0,7
Consumer services	29	12	41	9,2
Health care	8	10	18	4,0
Consumer goods	24	46	70	15,7
Basic materials	24	38	62	13,9
Utilities	11	17	28	6,3
Telecommunications	0	0	0	0,0
Total	244	202	446	100,0

Note: HNX: Hanoi Stock Exchange, HOSE: Hochiminh Stock Exchange

Source: Calculated using data from Stoxplus

Table 1 shows that most listed firms are in the industrial sector, with 45.5% of the total number of firms. This is followed by basic material industry and consumer goods industry, accounting for 14% to 16% of the total number of firms. The oil and gas industry and telecommunication industry are at the bottom of the list with few or none listed on the stock market.

3.2 Methodology

Following Abor (2005), Singh and Faircloth (2005), Jiraporn and Liu (2008), Chowdhury *et al* (2010), Dawar (2014) Seetanah *et al* (2014), Zeitun and Haq (2015), this research uses the following model:

$$Q_{it} = \beta_0 + \beta_1 LEV_{it} + \beta_2 SIZE + \beta_3 TANG + \beta_4 GROW_{it} + \beta_5 DIV_{it} + \beta_6 LIQ_{it} + \beta_7 GOV_{it} + \varepsilon_{it}$$

where $i = 1, 2, 3, 4, \dots, 446$ and $t = 1, 2, 3 \dots 7$ (from 2011 to 2017) (1)

The definitions of variables are presented in Table 2:

Table 2. The definitions of variables

Variable name	Definition	Research
Dependent variable		
Q	Tobin's Q = (sum of the market value of common stock shares and the book value of liabilities)/The book value of total assets	Tobin and Brainard (1968), Jiraporn and Liu Y(2008), Zeitun and Haq (2015)
Independent variable		
LEV	Capital structure = Ratio of total debt to total assets	Abor (2005); Jiraporn and Liu (2008), Le (2015)
Control variables		
SIZE	The natural log of firm's assets	Abor (2005); Dawar (2014); Margaritis and Psillaki (2010); Seetanah <i>et al.</i> (2014); Ebaid (2009)
TANG	The ratio of fixed assets divided by total assets	Dawar (2014); Margaritis and Psillaki (2010); Weill (2008)
GROW	The growth in the sales (the sales in the current year minus the sales in previous year divided by the sales in previous year)	Dawar (2014); Shyu (2012); Zeitun and Haq (2015)
DIV	The dividend payout divided by earning after tax	Shyu (2012)
LIQ	The ratio of total current assets divided by total current liabilities	Dawar (2014); Singh và Schimigall (2002)
GOV	The percentage of a total number of shares that the government owns	Vo (2014)

Source: Calculated by the author

The model is estimated by the ordinary least squares (OLS) model, the Fixed Effects model and the Random Effects model, and the quantile regression model. The OLS and panel data model estimation are standard estimation techniques, which are employed for the purpose of comparison. The study uses the Hausman test to compare the Fixed Effect model and the Random Effects model. The null hypothesis is that firms' individual effects are not correlated with independent variables, against the alternative hypothesis that there is correlation between

firms' individual effects and independent variables. As a result of rejecting the null hypothesis, we conclude that the Fixed Effects result is more appropriate.

In addition, the quantile regression helps to understand the relationships between variables beyond the mean of the data, helps to understand the non-normal distribution results and nonlinear relationships with predictor variables (Cook and Manning, 2013). Quantiles are distribution points in relation to the rank order of values in that distribution (Statistical Help, 2019). The q th quantile of a data set is defined as that value where a q fraction of the data is below that value and $(1-q)$ fraction of the data is above that value. For example, 10th quantile (q_{10}) is the value where 10% of the data is below and 90% of the data is above that value. According to the quantile regression method, the study will explore the effect of capital structure on firm value according to the 10th quantile (q_{10}) to the 90th quantile (q_{90}) of the dependent variable Tobin's Q.

4. Empirical results

4.1 Descriptive statistics

Summary statistics for the variables used in the study are provided in Table 3. The average of Tobin's Q for the sample over the period of 2011-2017 is about 0.888. The average of leverage accounts for 50.7% and widely disperses, from 0.6% to 97.1%.

Table 3. Descriptive statistics during 2011 - 2017

Variable	Observations	Median	Mean	Std. Dev	Minimum	Maximum
Q	3122	0.830	0.888	0.411	0.195	8.970
LEV	3122	0.536	0.507	0.221	0.006	0.971
SIZE	3122	26.909	26.982	1.474	23.330	31.922
TANG	3122	0.206	0.262	0.213	0.000	0.970
GROW	3122	0.079	0.270	5.037	-0.990	244.456
DIV	3122	0.468	0.478	0.521	0.000	10.484
LIQ	3122	1.394	2.071	2.257	0.143	35.332
GOV	3122	0.086	0.207	0.235	0.000	0.844

Source: Calculated using data from Stoxplus

Correlation analysis is used to determine the links between the firm value and firm's specific variables for the whole period. The pairwise correlation matrix is presented in Table 4. Overall, most correlation coefficients among variables are quite low, which indicates that there is no serious multicollinearity problem among the variables used in the study.

Table 4. Correlation matrix

	Q	LEV	SIZE	TANG	GROW	DIV	LIQ	GOV
Q	1.00							
LEV	-0.01	1.00						
SIZE	0.16	0.35	1.00					
TANG	0.00	-0.06	0.10	1.00				
GROW	0.00	0.00	-0.02	-0.02	1.00			
DIV	0.03	0.03	-0.01	-0.01	0.00	1.00		
LIQ	0.01	-0.32	-0.11	-0.10	0.00	-0.01	1.00	
GOV	0.06	0.08	-0.01	0.08	-0.02	0.01	-0.05	1.00

Source: Calculated using data from Stoxplus

4.2 Results with OLS, Fixed Effects and quantile regression models

In this section, the study first presents the relationship between capital structure and firm value with OLS regression and Fixed Effects regression. The coefficients reflecting this relationship are significantly negative (Table 5). This result indicates that the firm value worsens when the debt ratio increases.

Nonetheless, a significant negative relationship does not occur for firms in the lower quantiles (in Table 5, from the 10th to 60th quantiles) of the firm value distribution. The relationship between LEV and Tobin's Q derived from the quantiles regression shows that LEV has a significantly positive effect for firms in the lower, middle Tobin's Q quantiles and becomes significantly negative effect for firms in the higher quantiles (above 70th quantiles). Table 6 presents F tests that reveal a significant difference between slope estimates at the θ against $(1 - \theta)$ quantiles across various quantiles at the 1% level.

The results reveal that with Vietnamese firms having lower market value (i.e., the lower quantile levels), the increase of debt ratio will give a positive signal to investors. These findings are in line with the results of Chowdhury (2010), Bui (2016) and Vo (2017). Nevertheless, the coefficients between leverage and firm value decrease from 0.694 to -0.779 when the Tobin's Q changes from the lowest to the highest quantiles. At the high level of Tobin's Q, the leverage has a significantly negative effect on firm value. This negative relationship is consistent with the results provided by Masulis (1983), Singh and Faircloth (2005), Zeitun and Haq (2015), Dawar (2014), Seetanah *et al.* (2014) and Le (2015).

Moreover, the quantiles regression approach reveals features concerning the relationship between firm financial characteristics (firm size, asset tangibility, growth opportunities, dividend payout, liquidity and State ownership) and the firm value. The firm size and state ownership have significantly positive effect on firm value. The relationship between state

Table 5. The firm value regression results

Variable	OLS	FE	q10	q20	q30	q40	q50	q60	q70	q80	q90
LEV	-0.152*** (-2.82)	-0.168** (-2.27)	0.694*** (47.52)	0.567*** (42.07)	0.468*** (36.41)	0.368*** (15.01)	0.249*** (9.74)	0.085*** (2.94)	-0.071** (-2.26)	-0.327*** (-4.75)	-0.779*** (-7.93)
SIZE	0.053*** (5.62)	0.316*** (16.50)	0.010*** (4.66)	0.015*** (6.43)	0.018*** (9.87)	0.020*** (9.10)	0.024*** (7.59)	0.032*** (6.52)	0.037*** (6.44)	0.049*** (7.21)	0.039*** (5.21)
TANG	-0.063** (-2.14)	-0.205*** (-2.96)	-0.012* (-1.76)	-0.019** (-2.54)	-0.031*** (-4.06)	-0.025** (-2.54)	-0.039** (-2.48)	-0.047*** (-3.72)	-0.035*** (-2.86)	-0.034 (-1.28)	-0.058 (-1.45)
GROW	0.000 (1.31)	-0.001 (-0.51)	0.000 (0.17)	0.000 (0.23)	0.001 (0.33)	0.001 (0.22)	0.000 (0.09)	0.000 (0.06)	0.000 (0.05)	0.000 (0.05)	0.000 (0.04)
DIV	0.003* (1.71)	0.001 (0.69)	0.000 (0.01)	-0.000 (-0.06)	0.001 (0.56)	0.001 (0.29)	0.005 (0.81)	0.005 (1.29)	0.005 (0.84)	0.005 (0.59)	0.004 (0.49)
LIQ	0.000 (0.06)	0.001 (0.43)	0.001 (0.85)	0.000 (0.32)	0.001 (0.45)	0.001 (0.29)	0.000 (0.02)	-0.001 (-0.19)	-0.001 (-0.29)	0.014 (1.03)	0.038** (2.20)
GOV	0.117*** (3.94)	0.245*** (4.59)	0.030*** (3.79)	0.046*** (6.61)	0.032*** (4.37)	0.039*** (4.57)	0.037*** (3.53)	0.047*** (3.41)	0.043** (2.30)	0.027 (1.18)	0.017 (0.38)
cons	-0.482** (-2.08)	-7.561*** (-14.86)	-0.010 (-0.19)	-0.029 (-0.51)	-0.031 (-0.63)	0.002 (0.03)	0.006 (0.07)	-0.045 (-0.36)	-0.037 (-0.26)	-0.16 (-1.04)	0.247 (1.06)
R ² / Pseudo R ²	0.0352	0.5011	0.3076	0.2262	0.1634	0.1078	0.0602	0.031	0.021	0.0378	0.1082
N	3122	3122	3122	3122	3122	3122	3122	3122	3122	3122	3122

Note: *** stands for significant coefficient at 1% level; ** at 5%; * at 10%.

(In linear regression models, R² is a statistic that is frequently used as a goodness-of-fit measure. Because Quantile regression (QR) is not a linear regression model, pseudo R² is used to calculate the explanatory power of QR)

Source: Calculated using data from Stoxplus

Table 6. Tests of the equality-of-slope estimates across various quantiles

Quantiles	F-statistics	p-value
q10 vs. q90	219.51	0.0000
q20 vs. q80	142.45	0.0000
q30 vs. q70	199.83	0.0000
q40 vs. q60	212.99	0.0000

Source: Calculated using data from Stoxplus

ownership and firm value becomes insignificant for firms in the higher quantiles (above 80th quantiles). The proposed explanation is that larger firms have diversified activities, carry lower risk and lower variability in cash flow such that they are in a better position to explore profitable opportunities. In contrast, firm's tangibility has a negative and significant effect on firm value. This negative relationship is supported by the argument that the firms, who have larger amount of fixed assets, need more external finance, and can suffer more financial distress. This relationship becomes insignificant for firms in the higher quantiles (the 80th and 90th quantiles). Finally, the results show insignificant relationship between growth opportunities, dividend payout, liquidity and firm value.

5. Conclusions

The study employs several different methods including pooled OLS, FEM and quantile regression to capture parameter heterogeneity in researching the impact of capital structure on firm value. Using a balanced panel dataset of 3,122 observations of non-financial listed companies on Vietnam stock market in the period of 2011 to 2017, results from the Pooled OLS and Fixed Effects models show that capital structure has a significantly negative effect on firm value. Nonetheless, when using the quantile regression to analyze the non-linear relationship, the study points out that the relationship between capital structure and firm value varies significantly across quantiles of firm value.

The research findings indicate that when low-value firms need to raise capital, they should not issue more shares because the issuance costs are large and the amount of share capital that can obtain is lower. In this case, quantile regression shows that debt financing could give a positive signal to investors about the financial position of a firm and thus increase the firm value. In contrast, when a firm has a higher value (higher market price), selling shares to public helps increase capital quickly and make it more successful.

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