Original article

Debt maturity structure and firms' performance: Evidence from Vietnam

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Abstract

This paper investigates the impact of debt maturity structure on firms' performance for all non-financial firms listed on Ho Chi Minh City Stock Exchange and Hanoi Stock Exchange between 2010 and 2017. We find that an increase in the ratio of long-term debt over total debt is associated with a decrease in firms' performance. We also show that long-term debt financing can lead to a reduction in firms' performance because it dampens the positive impact of the investment on firms' performance. Our results are robust when we employ a System Generalized Methods of Moments to deal with endogeneity problems.

JEL classification: G30

Keywords: Debt maturity, Investment, Firm performance, Emerging market

1. Introduction

When studying the choice of capital structure of a firm, most of the previous studies often focus on how the mix of debt and equity exerts an impact on the firm performance (e.g., Modigliani and Miller, 1958; Modigliani and Miller, 1963; Myers, 1977; Masulis, 1983; Majumdar and Chhibber, 1999; Margaritis and Psillaki, 2007; Margaritis et al., 2010). Compared to these studies, studies investigating how the debt maturity structure, which relates to the choice of long-term debt or short-term debt, affects the firm performance are rather limited. Most studies investigating a debt maturity structure focus on the determinants of a debt maturity structure (e.g., Diamond, 1991; Barclay and Smith, 1995; Stohs and Mauer, 1996) or focus on the impact of a debt maturity structure on firms' investment (e.g., Aivazian et al., 2005; Dang, 2011). Given that a debt maturity structure is important in financial management, it is surprising that the number of studies examining the impact of debt maturity structure on the firm performance is scarce.

Using data consisting of all non-financial companies listed on Ho Chi Minh City Stock Exchange and Hanoi Stock Exchange between 2010 and 2017, we examine the impact of a debt maturity structure, measured by the ratio of long-term debt over total debt, on the firm performance. Our results indicate that an increase in the ratio of long-term debt over total debt is associated with a decrease in firms' performance. We show that one standard deviation increase in the ratio of long-term debt over total debt can lead to more than 10% reduction in the firms' return on assets (ROA) or approximately 3% reduction in the firms' Tobin Q index

(TOBINQ). This result supports the finding of Abor (2005), Sadeghian et al. (2012), Yazdanfar and Ohman (2015) and Premph et al. (2016), who find a negative relationship between the long-term debt financing and firm performance.

Additionally, we attempt to explain why using long-term debt is associated with a reduction in firms' performance. The result of Dang (2011) implies that the use of long-term debt cannot reduce the underinvestment problems and therefore it can reduce the firm performance. We find evidence supporting his result. To cope with the endogenous problem in our research models, we apply a System Generalized Method of Moments (SGMM) model. Our results are robust when using the SGMM model.

Our paper contributes to the literature on the relationship between debt financing and firm performance as follows. Some empirical studies investigate the relationship between debt financing and firms' performance (e.g., Abor, 2005; Sadeghian et al., 2012; Yazdanfar and Ohman, 2015; Premph et al., 2016). These studies employ a ratio of short-term debt on total assets (or total capital) and a ratio of long-term debt on total assets (or total capital) as proxies for debt financing. Almost all of them find that both long-term debt financing and short-term debt financing can lead to a reduction in firm performance. Our paper differs from those studies in two perspectives.

First, we focus on the debt maturity structure that is proxied by the ratio of long-term debt over total debt. We find a negative relationship between this ratio and firms' performance. As a result, our result suggests that if both long-term debt and short-term debt financing can reduce the firms' performance, the negative impact of long-term debt financing on firms' performance may be stronger

than one of short-term debt. Furthermore, we find a channel that explains this result. Our result shows that long-term debt financing can lead to a reduction in firms' performance because it dampens the positive impact of the investment on firms' performance.

Second, we believe we are the first to provide evidence of the relationship between the debt maturity structure and firms' performance in Vietnam. Djankov et al. (2007) construct a creditor rights index, ranging from 0 to 4, that measures the relative strength of creditors over lenders. A higher creditor rights index indicates stronger rights of the creditors. According to Djankov et al. (2007), the creditor rights index of Vietnam is 1. This suggests that the creditor right in Vietnam is rather weak. Given that borrowers have less pressure on paying the principal and interest expenses of the long-term debt than one of short-term debt, our results that the long-term debt ratio is negatively associated with the firms' performance may reflect the inefficiency in the use of long-term debt (compared to the use of short-term debt) of the Vietnamese firms.

The rest of this paper is structured as follows. Section 2 provides literature on the impact of debt maturity structure on firm performance. Section 3 presents our data and research methods. The empirical results of this paper are provided in Section 4. Section 5 concludes and suggests some policy implications.

2. Literature review

2.1. Debt maturity structure and firm value

The debt structure of a firm represents a set of payment obligations that the firm owes debt holders. If a firm can manage debt effectively, the firm can increase its cash flow and develop sustainably. A firm can raise money by issuing stock (equity financing) or bond (debt financing) in order to cover operating expenses or invest in fixed assets. Whereas equity financing does not require the firm to pay a fixed amount of money, debt financing requires the firm to pay the debt's principal and interest expenses at a specific day in the future. As a result, a firm needs to use debt effectively to avoid any bankruptcy costs that can occur due to the failure to pay the debt's principal and interest expenses. Moreover, using debt effectively can help the firm get a flexible and long-term financial source with lower interest rates than equity. By examining the debt structure, a company can forecast its cash flow and fulfill its debt's obligations. Therefore, it can manage its cash flow better and increase its performance.

The debt maturity structure of a firm is divided into short-term debt and long-term debt. Short-term debt represents a money obligation that the firm is responsible to pay within a year or a normal business cycle. Short-term debt has a low cost of capital but it puts pressure on the firm to pay money in the short term. In contrast, long-term debt represents a money obligation that the firm is responsible to pay over a period of more than one year. Compared to short-term debt, long-term debt has a higher cost of capital but the firm does not have pressure to pay the debt in a short-term period.

The corporate debt maturity structure has attracted considerable attention from many scholars around the world. Most of them investigate the determinants of a debt maturity structure (e.g., Diamond, 1991; Barclay and Smith, 1995; Stohs and Mauer, 1996) or examine the impact of a debt maturity structure on firms' investment (e.g., Aivazian et al., 2005; Dang, 2011). Diamond (1991) indicates that a firm with higher (lower) credit ratings prefers short-term (long-term) debt. Barclay and Smith (1995) show that long-term debt ratio is positively associated with the firm growth option, firm size and negatively associated with the

information asymmetries. Stohs and Mauer (1996) also document a positive relationship between the use of long-term debt and firm size. In addition, they find that firms are more likely to use short-term debt when their bond ratings are very high or very low. Aivazian et al. (2005) show that a high percentage of long-term debt in total debt can lead to a reduction in investment for firms with high growth opportunities. Dang (2011) finds that long-term debt can dampen the positive impact of the growth opportunities on the firms' investment. Virtually all of these empirical studies use the ratio of long-term debt over total debt as a proxy for debt maturity structure.

Many studies investigate the impact of debt financing, measured by the ratio of long-term debt over total assets (or total capital) and the ratio of short-term debt over total assets (or total capital) on the firms' performance (e.g., Abor, 2005; Abor, 2007; Sadeghian et al., 2012; Yazdanfar and Ohman, 2015; Prempeh et al., 2016). Most of them find that both the ratios of long-term debt and short-term debt are negatively associated with the firms' performance, which is measured by return on assets, return on equity, or Tobin Q. However, the number of studies examining the relationship between the debt maturity structure, which is measured as the long-term debt over total debt, and the firm performance is rare.

Theoretically, using a short-term debt can help reduce the underinvestment problem because the firm that has already paid all the short-term debt obligations can negotiate with creditors for a loan with more favorable terms before investing in a new investment project (Dang, 2011). The studies of Aivazian et al. (2005) and Dang (2011) provide evidence showing a negative relationship between the use of long-term debt and investment for firms with high growth option. If we assume that an increase in investment can enhance firms' performance, the results of Aivaziann et al. (2005) and Dang (2011) imply that the firm that possesses a debt maturity structure consisting of more short-term debt may have better performance than one with more long-term debt in its debt maturity structure. Therefore, this paper develops the following research hypothesis:

Hypothesis 1: Debt maturity structure, measured by the ratio of long-term debt over total debt, has a negative relationship with the firms' performance.

2.2. Determinants of firms' performance

This section reviews the literature on the determinants of firms' performance. The first determinant is the firm size. Firm size is argued to have positive relationship with the firms' performance because a large firm can enjoy benefits from economies of scale or a large firm can diversify the products more and have a larger market share than the small one (e.g., Majumdar and Chhibber, 1999; Garcia-Teruel and Martinez-Solano, 2007; Jermias, 2008).

The second determinant is the firm leverage. Using debt can reduce the tax burden, thereby increasing the firm value. The studies of Modigliani and Miller (1958) and Hoyt and Liebenberg (2011) show that the firm financial leverage can increase the firm value. However, the excessive use of financial leverage can cause financial exhaustion and reduce the firm value or even can lead to bankruptcy. Myers (1977) mentions that firms with better performance tend to avoid debt and prefer to use their internal capital.

The third determinant is the firm liquidity, which reflects the firm solvency. The firm liquidity is argued to be inversely related to the firm value because high liquidity is a signal of ineffective use of cash (Agrawal and Knoeber, 1996). The final

determinants are the firm investment. A high investment firm is considered to have good performance (Maury, 2006).

3. Data and research methods

3.1. Data
The data in this study includes all listed companies on Ho Chi Minh City Stock Exchanges and Hanoi Stock Exchange between 2010 and 2017. Following Dang (2011), we exclude financial firms from our sample because the characteristics of financial firms are substantially different from those in other industry sectors. The financial data of these firms is collected from the Bloomberg database.

3.2. Research Methods
To investigate the impact of debt maturity structure on firm performance, we apply a Pooled Ordinary Least Squares (Pooled OLS) model to estimate the following equation:

$$FIRM\_PERFORMANCE_{i,t} = \alpha + \beta_1 \ DEBT\_MATURITY_{i,t} + \gamma \ CONTROL_{it} + \varepsilon_{i,t} \quad (1)$$

where i indicates company i and t indicates year t. The dependent variable of Equation 1, FIRM_PERFORMANCE, is ROA or

TOBINQ. ROA is measured by the ratio of the firm's net income over the total assets. TOBINQ is measured as the ratio of the market value of total assets over the book value of total assets.

The independent variable of model (1) is DEBT_MATURITY, which is measured by the ratio of the firm's long-term debt divided by the total debt. The coefficient on DEBT_MATURITY is expected to be negative. CONTROL is a set of control variables. We select the control variables based on the discussion in Section 2.2. The first control variable, FIRM_SIZE, controls the impact of firm size. This variable is measured by the natural logarithm of the market value of the firm's total assets. The market value of the total assets is calculated as the total debt plus the market value of the equity. The second control variable is LEVERAGE, calculated as the ratio of the firm's total debt over the total assets. The third control variable is LIQUIDITY, which controls the impact of the firm's liquidity on the firm's performance. This variable is computed as the ratio of the firm's current assets over the firm's current liabilities. The final control variable, INVESTMENT, is measured by the ratio of the firm's capital expenditure divided by the total assets. The definition of these variables is summarized in Table 1.

Table 1: Definition of variables

This table provides the definition of variables used in this study.

Variable	Definition
ROA	Net income / Total assets
TOBINQ	Market value of total assets / Book value of total assets
DEBT_MATURITY	Long-term debts / Total debts
FIRM_SIZE	Natural logarithm of the total market value of assets. The market value of total assets is calculated as the total debt plus the market value of equity.
LEVERAGE	Total debts / Total assets
LIQUIDITY	Current assets / Current liabilities
INVESTMENT	Capital expenditure/ Total assets

Finally, ε is the error of Equation 1. We include industry dummy variables and year dummy variables in Equation 1 to capture the industry fixed effects and the year fixed effects. The standard error is adjusted for heteroskedasticity and clustered at the firm level.

The Pooled OLS model is commonly used in econometrics. The advantage of this model is that the calculation of its parameters is not too complicated. However, if the variables in the model are endogenous, the estimated value of the parameters will be biased. Additionally, Equation 1 does not consider the "dynamic" effects of the firm's performance. For example, the firm's performance in the previous year may have a positive impact on the firm's performance in the current year. As a result, we estimate the following equation:

$$FIRM\_PERFORMANCE_{i,t} = \alpha + \beta_1 \ FIRM\_PERFORMANCE_{i,t-1} + \beta_2 \ DEBT\_MATURITY_{i,t} + \gamma \ CONTROL_{i,t} + \varepsilon_{i,t} \quad (2)$$

We add the one-year lag of the dependent variable to the right-hand side of Equation 2 to capture the dynamic effects of the model. When we estimate Equation 2 by a Pooled OLS model, the lag of the dependent variable in the right-hand side of the model will be correlated with the error and therefore endogeneity problems will occur, making our estimation biased. Moreover, the independent variables and other control variables can have simultaneous relationships with the dependent variables, which can cause the endogeneity problem in our model. Therefore, we use a System

Generalized Method of Moments (SGMM) model to estimate Equation 2.

A SGMM model uses the lag of the endogenous variables as the instrumental variables for the endogenous variables in the model (Blundell and Bond, 1998). In our models, all the financial variables are assumed to be endogenous. We use two tests to check the validity of a SGMM model. The first test is to test the second auto-correlation of the error in the model (AR(2) test). The second test is the Hansen test that checks the validity of the instrumental variables in the model. The use of the SGMM model is appropriate if these two tests show statistically insignificant results. To reduce the redundancy of the instrumental variables, we use the three-year or four-year lags of the endogenous variables.

Similar to Equation 1, we include industry dummy and year dummy variables in Equation 2 to capture the industry fixed effects and the year fixed effects. The standard error is also adjusted for heteroskedasticity and clustered at the firm level.

4. Empirical results

4.1. The impact of debt maturity structure on firms' performance
Table 2 provides descriptive statistics for the variables used in this study. The mean values of ROA and TOBINQ are 0.059 and 0.775, respectively. The mean value of Tobin's Q is less than 1, indicating that on average the market does not value the assets of the company higher than the book value. This implies that the firms in

our sample seem not to perform effectively. In addition, the mean value of DEBT_MATURITY is approximately 0.3, suggesting that the firms are more likely to use short-term debt. The minimum and maximum values of this variable are 0 and 1, respectively, which indicates that there are firms that use only short-term debt and there are firms that only use long-term debt. The large variation of DEBT_MATURITY also helps us to investigate the impact of debt maturity structure on the firms' performance.

Table 2: Descriptive statistics

This table provides descriptive statistics for variables used in this study. The definition of these variables is provided in Table 1. All variables are winsorized at the 1st and 99th percentile level.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	4,524	0.059	0.072	-0.170	0.318
Tobin's Q	4,226	0.775	0.505	0.146	3.250
Debt Maturity	3,857	0.271	0.316	0.000	1.000
Firm Size	4,226	12.752	1.636	9.139	17.205
Leverage	4,527	0.231	0.190	0.000	0.684
Liquidity	4,531	2.188	2.269	0.391	15.714
Investment	4,510	0.052	0.068	0.000	0.333

Table 3 provides the correlation matrix between the variables employed in this study. Table 3 shows that all the correlation coefficients between the independent and control variables in the model are less than 0.7, suggesting that our regression models do not have multicollinearity problems.

Table 3: Correlation matrix

This table provides a correlation matrix between variables used in this study. The definition of these variables is provided in Table 1. All variables are winsorized at the 1st and 99th percentile level.

	(1)	(2)	(3)	(4)	(5)		(6)
(1) ROA	1.000						
(2) Tobin's Q	0.515	1.000					
(3) DebtMaturity	0.023	0.130	1.000				
(4) FirmSize	0.178	0.475	0.302	1.000			
(5) Leverage	-0.320	0.044	0.148	0.364	1.000		
(6) Liquidity	0.222	0.126	0.087	-0.044	-0.411	1.000	
(7) Investment	0.186	0.196	0.322	0.138	0.140	-0.090	1.000

Table 4: The impact of debt maturity structure on the firms' performance

This table provides the results of the relationship between debt maturity structure and the firm performance of the listed companies on Ho Chi Minh Stock Exchange and Hanoi Stock Exchange in the period from 2010 to 2017. We use a Pooled OLS model in columns 1 and 2 and a SGMM model in columns 3 and 4,

respectively. In columns 1 and 3, the dependent variable is ROA. In columns 2 and 4, the dependent variable is TOBINQ. The definition of the variables is provided in Table 1. We include industry dummy and year dummy variables in the models. The standard error is adjusted for heteroskedasticity and clustered at the firm level. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

	Dependent variables			
	Pooled OLS		SGMM	
	ROA	TOBINQ	ROA	TOBINQ
VARIABLES	(1)	(2)	(3)	(4)
L.ROA			0.635***	
			(0.112)	
L.TOBINQ				0.420***
				(0.104)
DEBT_MATURITY	-0.023***	-0.085*	-0.018	-0.367***
	(0.005)	(0.044)	(0.024)	(0.137)
INVESTMENT	0.178***	0.845***	-0.046	1.695***
	(0.020)	(0.169)	(0.103)	(0.580)
FIRM_SIZE	0.014***	0.137***	0.010**	0.142***
	(0.001)	(0.015)	(0.005)	(0.038)
LEVERAGE	-0.170***	-0.331***	-0.033	-0.295
	(0.011)	(0.104)	(0.039)	(0.200)
LIQUIDITY	0.002	0.024**	0.000	-0.003
	(0.001)	(0.012)	(0.005)	(0.021)
Constant	-0.118***	-0.992***	-0.108*	-1.313***
	(0.018)	(0.181)	(0.056)	(0.398)

Observations	3,582	3,584	3,137	3,000
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R-squared	0.330	0.357	0.515	0.587
AR(2) test (pvalue)			0.180	0.061
Hansen test (pvalue)			0.360	0.193

Table 4 provides the empirical results of the relationship between debt maturity structure and the firms' performance. We report the results estimated by a Pooled OLS model in columns 1 and 2 and by a SGMM model in columns 3 and 4, respectively. The results show that the coefficient on DEBT_MATURITY is negative and significant in 3 out of 4 columns. Specifically, in column 1, the dependent variable is ROA and the coefficient on DEBT_MATURITY is significantly negative at the 1% level. In economic term, one standard deviation increase in DEBT_MATURITY can decrease ROA by approximately 10.6%. In column 2, the dependent variable is TOBINQ and the coefficient on DEBT_MATURITY is significantly negative at the 10% level. In economic term, one standard deviation increase in DEBT_MATURITY can decrease TOBINQ by around 3.0%. In column 3, the dependent variable is ROA and the coefficient on DEBT_MATURITY is negative albeit statistically insignificant. In column 4, the dependent variable is TOBINQ and the coefficient on DEBT_MATURITY is significantly negative. The post-estimation tests of the SGMM confirm the validity of the SGMM model. The results show that the AR(2) test in columns 3 is statistically insignificant whereas the AR(2) test in columns 4 is only significant at the 10% level. Moreover, the Hansen tests in both columns 3 and 4 are statically insignificant, suggesting that the instrumental variables are valid. Overall, these results support our hypothesis 1.

Regarding the lag of the dependent variables, our result shows that the coefficients on these lag variables are positive and significant at the 1% level in columns 3 and 4. This suggests that firms with good performance in the previous year can have good performance in the current year. With respect to control variables, our results show that larger firms or firms with a high investment are associated with better performance. The other control variables seem not to have a statistically significant impact on the firm performance.

4.2. Why does the debt structure have a negative impact on the performance of businesses?

In this section, we attempt to explain why the debt maturity structure that is measured by the ratio of the firms' long-term debt to total debt has a negative impact on the firms' performance. Dang (2011) mentions that using short-term debt can help the firms reduce the underinvestment problems. This implies that the use of long-term debt cannot reduce the underinvestment problem and thus it can decrease the firm performance. To examine this prediction, we interact DEBT_MATURITY and INVESTMENT in Equations 1 and 2 and expect that the coefficient on this interaction term is negative. The results are reported in Table 5.

Table 5: Impacts of debt maturity structure on the relationship between firm investment and firm performance

*This table provides the results of how debt maturity structure affects the relationship between firm investment and firm performance. Our data consists of all listed companies on Ho Chi Minh Stock Exchange and Hanoi Stock Exchange during the period from 2010 to 2017. We use a Pooled OLS model in columns 1 and 2 and a SGMM model in columns 3 and 4, respectively. In columns 1 and 3, the dependent variable is ROA. In columns 2 and 4, the dependent variable is TOBINQ. The definition of the variables is provided in Table 1. We include industry dummy and year dummy variables in the models. The standard error is adjusted for heteroskedasticity and clustered at the firm level. ***, **, and * represent statistical significance at the 1%, 5%, and 10% level,respectively.*

	Dependent variables			
	Pooled OLS		SGMM	
	ROA	TOBINQ	ROA	TOBINQ
VARIABLES	(1)	(2)	(3)	(4)
L.ROA			0.465***	
			(0.079)	
L.TOBINQ				0.555***
				(0.079)
DEBT_MATURITY	-0.015**	-0.032	0.034	-0.203
	(0.006)	(0.048)	(0.021)	(0.132)
INVESTMENT	0.247***	1.290***	0.443***	2.594***
	(0.030)	(0.211)	(0.142)	(0.943)
DEBT_MATURITY * INVESTMENT	-0.147***	-0.948***	-0.512***	-2.096*
	(0.049)	(0.360)	(0.166)	(1.247)
FIRM_SIZE	0.013***	0.135***	0.006	0.082***
	(0.001)	(0.015)	(0.004)	(0.026)
LEVERAGE	-0.169***	-0.320***	-0.077*	-0.141
	(0.011)	(0.104)	(0.041)	(0.198)
LIQUIDITY	0.002	0.025**	0.001	0.005

		(0.001)	(0.012)	(0.004)	(0.021)
Constant		-0.118***	-0.993***	-0.069	-0.741***
		(0.018)	(0.181)	(0.043)	(0.256)
Observations		3,582	3,584	3,137	3,000
Industry fixed effects		Yes	Yes	Yes	Yes
Year dummy fixed effects		Yes	Yes	Yes	Yes
R-squared		0.333	0.359	0.487	0.648
AR(2) test (pvalue)				0.155	0.141
Hansen test (pvalue)				0.434	0.195

Similar to Table 4, columns 1 and 2 of Table 5 use a Pooled OLS model and columns 3 and 4 of Table 5 use a SGMM model. The results show that the coefficient on INVESTMENT is significantly positive while the coefficient on the interaction term between DEBT_MATURITY and INVESTMENT is significantly negative in all four columns, suggesting that a high proportion of long-term debt in total debt can weaken the positive impact of investment on firm performance. This finding supports our prediction above. The post-estimation tests of the SGMM model confirm the validity of this model. Specifically, neither the AR (2) test nor Hansen test is statistically significant at the traditional level.

5. Conclusion

This paper investigates the impact of debt maturity structure, measured by the ratio of the firms' long-term debt over the total debt, on the performance of all listed companies on Ho Chi Minh City Stock Exchange and Hanoi Stock Exchange between 2010 and 2017. We show that an increase in the ratio of the firms' long-term debt over the total debt can lead to a decrease in firms' performance, measured by ROA or TOBINQ. We also find a channel explaining this result. Our results indicate that the long-term debt ratio can reduce the firms' performance because it dampens the positive impact of the firms' investment on the firms' performance. To deal with the endogeneity problems, we employ a SGMM model and find that our results are robust to the SGMM model.

Overall, our results suggest that the Vietnam listed firms do not use the long-term debt as efficiently as the short-term debt. Nevertheless, the long-term debt is an important source of capital for the firms' investment. Consequently, the Vietnamese government should have sound policies that can support the firms so that the firms can use the long-term debt more effectively. For example, these policies should be able to eliminate the dampening effects of the long-term debt on the positive relationship between the firms' investment and the firms' performance.

Data Availability

The data in this study includes all listed companies on Ho Chi Minh City Stock Exchanges and Hanoi Stock Exchange between 2010 and 2017, which is collected from Bloomberg, website: https://www.bloomberg.com/quote/VNINDEX:IND

Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

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