The choice of capital structure: A study on energy industry in a developing country

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CHRONICLE	ABSTRACT
	The choice of capital structure has greatly contributed to the success of the firms in general and energy in particular. This study uses a sample data set of 250 energy firms over the period 2010-2019, and by using generalized least square (GLS) method to perform a survey. The main factors in this study include profitability, firm age, state shareholding and depreciation tax shield, etc. The study found that except firm growth, all factors including firm performance, age of firm, size of firm, asset structure, short-term solvency, and depreciation have significantly affected firm's capital structure choice in the case of energy industry in a developing country. Furthermore, a positive effect was also found for size of firm and asset structure while a negative effect was detected for other factors such as firm performance, asset structure, firm age, short-term solvency, and depreciation. Through this research, we also conclude that the theory of pecking order, and the theory of representative cost are known as the basis for financial managers to build sound capital structures for businesses.

1. Introduction

Nowadays, energy market is growing rapidly in both developed and emerging economies worldwide (Acaravci & Ozturk, 2010; Mah, 2000; Shahbaz et al., 2014; Tang & Nair, 2002; Wooldrige, 2002). Based on the research of International Energy Association, Southeast Asian economies energy demand is considered to grow by 60 percent between 2020 and 2040. To conduct this expectation, the growth and success of energy industry have become a serious target in the future. In each country, energy is the most common and basic source widely used in the context of economic development and the human being's lives. Vietnam is one of the most efficient power markets in the region. Specifically, Vietnam's energy industry has witnessed impressive growth over the last decades with many energy projects along with the development of gas electricity and treatment facilities on the mainland (Tran & Vu, 2019). Therefore, the number of energy businesses have increasingly developed day by day. The growth of the energy industry is a positive factor for the development of the energy industry and energy firms, thereby leading to many other production and service industries such as gas and oil sector, manufacturing equipment and accessories, treatment, packaging and consulting services on design, quality and extractive exploration. However, in recent years, the energy industry has been in a very difficult period, supply exceeds demand, leading to a level of competition in this quite fierce industry. In light of the extraordinary impact of the Covid-19 pandemic and resulting lockdown measures on the energy system, global energy markets, and energy resilience have been badly affected. The firm performance of energy industry has been also damaged. Numerous of energy enterprises which desire to survive and thrive or surpass their competitors need to maximize their own financial strength and capacity (Modigliani & Miller, 1958). Building an appropriate capital structure is also a way for businesses to maximize their financial strength (Narayan et al., 2020; Singh & Kannadhasan, 2020; Sadiq et al., 2020; Shah et al., 2013; Le et al., 2020; Nguyen, 2019). The fact also has shown that there have been many irrationalities in the selection of capital structures, resulting in ineffective business operations. Therefore, capital restructuring solutions in the energy industry have been currently the top concerns of

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businesses (Narayan et al., 2020; Singh & Kannadhasan, 2020; Luong et al., 2020; Nguyen et al., 2020). The aim of this research is to explore the factors that have a significant impact on the capital structure of energy industry in the case of an emerging economy like Vietnam, and therefore finding a trend influence of the decisive factors to capital structure of it. For that purpose, this research result will contribute to reinforce the theory of capital structure of specific enterprises. In addition, the research results can also serve as a basis for the leaders in the cement industry to create financial strategies.

The rest of this study continues as: Section 2 discusses theoretical framework and literature review while data and research methodology are given in Section 3. Section 4 depicts research results and discussions while conclusion is presented in Section 5.

2. Theoretical framework and Literature Review

2.1. Theory on capital structure

As suggested in from Modigliani and Miller (1958) through a capital structure theory which focuses on the relationship between financial leverage and firm value based on assumptions in two indicators of tax and tax-free. Firstly, in a tax-free context, the value of the levered firm, and non-leveraged firm are the same. Secondly, in a taxed environment, the value of the levered firm is frequently higher than the other one in the case of without using financial leverage, due to the benefits of the tax shield. Theoretically, a tax shield is a reduction in taxable income for an individual or corporate achieved via claiming allowable deductions. Accordingly, this theory comes with assumptions that in reality cannot happen such as perfect capital markets, businesses operating without tax, and transactions made without cost. This is also the disadvantage of this theory. Therefore, the capital structure trade-off theory is mentioned below:

The theory of capital structure trade-off was significantly developed by Kraus and Litzenberger (1973). In the view of the capital structure trade-off theory, managers believe that they will find an optimal capital structure to maximize the firm value. An optimal leverage is achieved in a balance between the benefits and costs of debt. In other words, an optimal capital structure can be determined based on a trade-off between the benefits and costs of using debt. Using debt can derive benefits from the tax, and interest shield. Furthermore, more loans in their capital structure, the firm has the most benefit of the tax shield, however the trade-off with this benefit is an increase in financial distress (Myers, 2001). To establish this equilibrium, firms should seek debt ratios at which the financially miserable costs can offset the tax advantage of additional debt. Another assessment on the capital structure trade-off theory, the pecking order theory states that managers have more information about the growth potentials as well as the risks and values of the business than those of investors, therefore corporate executives will understand clearly the profitability of future projects. As consequence, if the projects have growth prospects and is expected to bring high profits, the manager will prioritize using the capital from retained earnings, so as not to have to share profits with new shareholders and make cost increase (by issuing new shares). In addition, the costs of external funding are very high (Myers, 1984). Another view regarding capital structure, the theory of representative cost refers to a conflict of interest between shareholders and managers. These conflicts, if not resolved, will significantly damage the profits of the business. Managers are always self-interested and willing to choose to invest in low-yield projects. In contrast, projects with a high rate of return often come with high risks, so if the project fails, the manager runs the risk of losing his job. In addition, the agency cost theory holds that capital structure will be an effective governance tool to solve the agency cost problem (Jensen & Meck-ling, 1976; Jensen, 1986). Accordingly, managers are forced to work actively to create profits, balance the business finances since they have to pay both periodic loan interests and principal debts.

2.2. Literature review

Narayan et al. (2020) tested the capital structure based on the trade-off, pecking order, and the market timing theories by using a sample of Islamic stocks and the leverage speed of adjustment, Narayan et al. (2020) found that the leverage speed of adjustment will be faster in Islamic stocks compared to that on conventional stocks, and it is consistent with trade-off theory. In a study in US, Titman and Wessels (1988) studied on 469 US firms in the period from 1974 to 1982, and showing that the positive correlation between assets, and firm size with capital structure meanwhile, an inversely correlated with capital structure for the profitability (ROA). Further investigated on this relationship, Rajan and Zingales (1995) analyzed data from 8,000 firms in the G-7 countries (USA, Japan, Germany, France, Italy, UK and Cananda) in the period. 1987-1991, and the result was similar to the study of Titman and Wessels (1988). In order to further contribute to capital structure theories, Nguyen (2020) analyzed data of manufacturing firms in Vietnam in 2020, indicating that property and business risk had a positive relationship with the debt ratio; in contrast, the profitability and the depreciation tax shield were inversely related to the debt ratio. As shown by Singh and Kannadhasan (2020) on the relationship between corruption and its impact on capital structure in 16 emerging economies using quantile regression model. Using 4236 firms in the 2002-2015 period, Singh and Kannadhasan (2020) found a heterogeneous linkage between corruption and leverage across quantiles. Specifically, a positive is found except at the 10th quantile while the effects become stronger at the higher quantiles. In the same field of research, Huang and Song (2006) conducted on 1,200 listed companies in China in the period of 1994-2003, and indicating that a strong role of factors such as profitability, growth opportunities, asset structure and taxes in determining capital structure can be existed. Specifically, profitability, taxes and growth opportunities had negative effects on capital structure; in contrast, the relationship between asset structure and capital structure was positive. In

agreement with theory of pecking order, Mutalib (2011) reviewed the determinants of capital structure of enterprises in Nigeria over the period 2004 - 2009. Major results show that asset structure, firm age and firm size had a positive impact on capital structure. Further discussed on this topic, profitability, growth opportunities and firm size had opposite effects on capital structure. In addition, Ningsih and Djuaeriah (2013) conducted a study on 30 leading firms in Indonesia and showed that EPS had a positive correlation with financial leverage while return on assets (ROA) had a negative impact, return on equity (ROE) had a positive impact on the debt ratio. Ningsih and Djuaeriah (2013) tried to explain that the existence of the capital structure based on trade-off theory and the theory of pecking order in the selection of capital structure may be differed in the case of Indonesia. All previous studies related to capital structure will be shown on the Table 1 as follows:

Table 1
Summary of results of previous studies

No	Independent Variables	Sign	Experimental research
1	Growth	+	Rajan và Zingales (1995); Mutalib (2011): Qayyum (2013)
2	Profitability	-	Titman and Wessels (1988); Rajan and Zingales (1995); Qayyum (2013): Shah et al. (2013); Narayan et al. (2020); Nguyen et al., 2020
3	Assets structure	+	Rajan and Zingales (1995); Huang và Song (2006); Shah et al. (2013); Qayyum (2013):
4	Firm size	+	Titman and Wessds (1988); Ang (1992); Rajan and Zingales (1995); Huang and Song (2002); Chen (2004); Narayan et al. (2020)
5	Firm age	+	Mutalib (2011); Keng et al. (2014)
6	Share ownership ratio (of the state)	+	Narayan et al. (2020); Nguyen (2020)
7	Short-term liquidity ratio	-	Myers and Majiluf (1984); Singh and Kannadhasan (2020)
8	Deferred tax depreciation	-	Myers and Majiluf (1984): Huang and Song (2002); Singh and Kannadhasan (2020)

Source: Synthesis of the authors

3. Data and Research Methodology

3.1. Data Collection

Research used data of 25 giant energy companies listed on the stock market of Vietnam, over the period 2010-2019 in order to estimate the relationship between a number of factors affecting the capital structure of the energy industry in Vietnam. In this study, we conduct qualitative methods through statistical analysis methods such as descriptive statistics, multivariate regression GLS (Generalized Least Square) to test the hypotheses raised in the study. The GLS regression method is an effective regression estimation method and overcomes the heteroskedasticity of the error and the autocorrelation phenomenon (Wooldrige, 2002).

3.2. Research Methodology

The regression model of this study will be extended by the research models of Narayan et al. (2020); Singh and Kannadhasan (2020); Qayyum (2013), Shah et al (2013); Ningsih and Djuaeriah (2013). Furthermore, the study has added a number of variables to fit the characteristics of the energy industry in Vietnam. The model is built as follows:

$$CS_{i,t} = a_0 + a_1.GROWTH_{i,t} + a_2.PROFIT_{i,t} + a_3.TANG_{i,t} + a_4.FIRMSIZE_{i,t}$$
$$+ a_5.FIRMAGE_{i,t} + a_6.SOE_{i,t} + a_7.LIQ_{i,t} + a_8.DEPRECIATION_{i,t} + u_{i,t}.$$

Table 2
Variables used in the study

No	Variable name	Symbol	Calculation	Sign
1	Capital Structure (CS)	LEV	Total debt/ Total assets	
		SLEV	Short-term debt/Total assets	
		LLEV	Long-term debt/Total assets	
2	Growth	GROWTH	(Revenue this year - Revenue last year)/Revenue last year	+
3	Profitability	PROFIT	Profit before tax and interest/Total assets	-
4	Property structure	TANG	Tangible fixed assets/Total assets	+
5	Business size	FIRMSIZE	Log (total assets)	-
6	Enterprise age	FIRMAGE	Log (current year - year of establishment)	+
7	Share ownership ratio of the state	SOE	(number of shares of the state)/(Total number of shares in circulation)	+
8	Short-term solvency	LIQ	Short-term assets/Short-term liabilities.	-
9	Deferred tax depreciation	DEPRECIATION	Depreciation/Total assets	-

Source: Synthesis of the authors

4. Research Results and Discussions

4.1. Descriptive Statistics

Table 3 shows that the variable LEV (debt ratio) was 62.3% (0.623) of debt in its capital structure. Therefore, this ratio is quite high due to energy firms in the direction of expansion in doing business.

Table 3

Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
LEV	0.623	0.158	0.098	0.919
SLEV	0.432	0.176	0.101	0.876
LLEV	0.234	0.212	0.123	0.612
GROWTH	0.146	0.302	-0.453	1.698
PROFIT	0.067	0.0345	-0.101	0.247
TANG	0.432	0.234	0.034	0.856
FIRMSIZE (106)	1.583.122	2.656.123	32.454	12.232.454
FIRMAGE	29.43	14.34	5.03	55.23
SOE	0.402	0.282	0	0.681
LIQ	1.287	0.76	0.23	5.234
DEPRECIATION	0.288	0.210	0	0.942

Source: Data collected from financial statements

In addition, the maximum debt ratio that enterprises use is 91.9% (0.919), showing that enterprises with business capital are completely dependent on debt, low financial autonomy. Therefore, businesses will be susceptible to risks when lending rates rise sharply. Meanwhile, the minimum debt ratio of 9.8% indicates that there are some businesses using very low debt ratios in their operations. Furthermore, Table 3 also indicates that energy firms listed tend to use short-term debt to finance their business operations with average short-term debt ratio is 43.2% (0.432), and average long-term debt ratio is 23.4% (0.234). In the case of Vietnam, banks are the main source of capital from outside to finance businesses. As a result, businesses have to rely heavily on funding sources that are liabilities (short-term liabilities), energy firms need to depend on bank's funding. Regarding growth rate (GROWTH) with a maximum value of 1.698 and a minimum value of -0.453, the growth rate between enterprises in the energy industry is 14.6%. For firm performance, some years, this indicator is negative and the lowest is -10% (-0.1). It can be realized that the actual operation of the energy industry in the research period, businesses are facing many difficulties, most of them are losing its profitability. Regarding asset structure (TANG), indicating that the value of tangible fixed assets in the energy industry is quite huge. In addition, firm age is changing between 5.03 years and 55.23 years, and the average is 29.43 years. As mentioned, energy industry is one of the earliest developed industries in Vietnam. In terms of firm size (SIZE), which indicates that the smallest value of 32,454 million VND, the largest value of 12,232,454 million VND. This also shows that some businesses are merely trading in energy source, while other firms tend to focus on investing in the construction of energy factories.

4.2. Regression Results

Table 4 indicates the regression results regarding capital structure and its variables that impact on capital structure. We have three models related to three proxies of capital structure including LEV, SLEV, and LLEV. The study will show the following results:

Table 4

Results using GLS estimation

Variable name	Dependent variable		
	LEV (Model 1)	SLEV (Model 2)	LLEV (Model 3)
Constant	0.343***	0.7867***	-0.4545***
GROWTH	-0.0043	0.045	-0.0343
PROFIT	-0.7876***	-0.565***	-0.0545
TANG	0.0232	-0.566***	0.5433***
FIRMSIZE	0.132***	0.0034	0.1322***
FIRMAGE	-0.112***	-0.0067	-0.1655***
SOE	-0.0345**	-0.0343**	0.0012
LIQ	-0.0765***	-0.1565***	0.0766***
DEPRECIATION	-0.0223*	0.0343	-0.0223*
Number of observations	250	250	250

*** p <0.01; ** p <0.05; * p <0.1;
Source: Results from STATA software

4.3. Discussions

The remaining variables will follow the statistical basis with significance level 1%, 5%, and up to 10%, so they are discussed in turn as follows:

Effects of profitability (PROFIT)

Table 4 shows that profitability is inversely correlated with either total debt total assets or the ratio of short-term debt/total assets. This correlation has been supported from pecking order theory and also supported by Shah et al (2013). This finding can be explained that businesses with higher profitability tend to be financed by internal capital sources rather than external sources. The use of external capital such as borrowing more debt increases the financial burden, while the issue of additional shares dilutes

shareholder ownership. In fact, high-profit businesses often use retained earnings to finance their own capital needs; businesses with low profits must increase their loans to ensure production and business activities. In the study of Shah et al (2013), they reaffirmed this argument and it is consistent with the case of Vietnam.

Asset structure

The ratio of tangible fixed assets to total assets has a positive effect on the debt ratio while the long-term debt ratio and is statistically significant at the 1% level (with p-value is lower than 0.01). However, the impact of the asset structure is not consistent with the ratio of short-term debt. In fact, collateral is a good, important condition for creditors to consider deciding whether to grant credit. Narayan et al. (2020) found that the leverage speed of adjustment will be faster in Islamic stocks compared to that on conventional stocks, and it is consistent with trade-off theory. In addition, the proportion of fixed assets accounts for a large proportion, enterprises have the opportunity to mortgage these assets to access external capital more easily, or in other words, they will increase their "debt capacity". In the energy industry, long-term loans mainly finance the construction of energy factory to form fixed assets for the business. This argument is consistent with the study of Nguyen (2020) analyzed data of manufacturing firms in Vietnam in 2020, indicating that property and business risk had a positive relationship with the debt ratio. Therefore, when fixed assets increase, the amount of long-term loans to finance projects also increases. It can be seen that fixed assets are of great importance when businesses decide to choose a long-term capital source to finance an energy factory.

Firm size (FIRMSIZE)

Table 4 shows that the positive effect of firm size is consistent with the capital structure that tends to use more debts, is also consistent with trade-off. This finding is strongly supported by a confirmation that a business size has a stronger the financial potential and a lower the risk of bankruptcy is. In addition, large-scale enterprises have a better reputation in the debt market, gain trust from creditors, so they can easily access loans and reduce transaction costs when issuing long-term debts.

Firm age (FIRMAGE)

Further discussed on how firm age impacts on capital structure in the energy industry in Vietnam, theoretical framework indicates that the older enterprises have been operating in the market, the more their position has been affirmed, the higher the prestige, and therefore a higher the ability to borrow capital from institutions. However, test results in Table 4 show a contrary effect. More discussions about this finding, it can be seen that most of the energy companies in the research period have not high demand for funding, because the energy industry is parallel with the freezing cycle of the economy. In the stage of economic depression, a bank also halted lending loans even to businesses that have been operating for a long time in the market. Vietnam has faced many problems in the energy industry in the period 2014 – 2019 with a numerous energy firms lost its profit and bankruptcy.

State shareholding

Table 4 indicates a contrast impact in the relationship between state shareholding and capital structure, affirming that the shareholding ratio of the state has opposite effects on the debt ratio and the short-term debt ratio and is statistically significant at significant 5% (p <0.05). Theoretically, the state shareholding is considered as a specific factor affecting the capital structure of Vietnamese energy companies. In Vietnam, firms with a high proportion of state ownership often have the advantage of easy borrowing. Nguyen (2020) analyzed data of manufacturing firms in Vietnam in 2020 and also found the similar finding regarding this relationship. In addition, Narayan et al. (2020) found leverage speed of adjustment will be highly faster in Islamic stocks compared to that on conventional stocks, and it is consistent with trade-off theory.

Short-term solvency, and Depreciation

Table 4 also discusses the impact of short-term solvency on its capital structure and a negative impact on the debt ratio and short-term debt ratio can be found. This evidence is consistent with the expectation and also affirmed that a firm with higher liquidity is less likely to use debt because their highly liquid assets which have been used to finance investment or production and business activities. Further, Table 4 also depicts the opposite effect of the depreciation tax shield on firm's capital structure. This inverse correlation was consistent with the initial expectation and consistent with the results of these previous studies.

5. Conclusion

Research on factors affecting the capital structure of energy enterprises over the period 2010-2019, using a sample data set of 250 observations and using GLS method has been conducted. The main factors have included profitability, firm age, state shareholding and depreciation tax shield, and other factors. The study has found that except firm growth, all factors such as firm performance, age of firm, size of firm, asset structure, short-term solvency, and depreciation have significantly affected firm's capital structure choice in the case of energy industry in Vietnam. Further, a positive effect can be found for size of firm, asset structure while most negative effects can be found for other factors. Research once again supports the theory of pecking order, and serves as the basis for financial managers to build sound capital structures for businesses.

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