Threshold Effect of Capital Structure on Firm Value: Evidence from Seafood Processing Enterprises in the South Central Region of Vietnam

Nguyen Thanh Cuong

Faculty of Accounting and Finance, Nha Trang University, VietNam

Abstract

The purpose of this paper is to investigate whether there is an optimal capital structure at which point firm is able to maximize its value. The author employ an advanced panel threshold regression estimation developed in 1999 by Hansen that will indicate whether there are positive and negative impacts of capital structure on firm value. The author has used data of among 90 unlisted Seafood Processing Enterprises in the South Central region of Vietnam (SEASCRs) during 2005–2011 period. The author has used book value of equity plus long- term debt (BVE) and return on equity (ROE) as surrogate for firm value and book value of total debt to total assets (TD/TA) as surrogate for capital structure and as the threshold variable.

The empirical results strongly indicate that triple threshold effect exists between debt ratio and firm value when BVE is selected to proxy firm value. However, when ROE is selected to proxy firm value, the result shows that there exists double thresholds effect between debt ratio and firm value. From these results, the author may conclude that the relationship between capital structure and firm value has a nonlinear relationship represents an convex Parapol shape. In addition, the findings suggest implications for SEASCRs on flexible usage of financial leverage. Specifically, SEASCRs should not use loans over 57.39%. To ensure and enhance the firm value, the scope of the optimal debt ratio should be less than 57.39%.

Keywords: Capital Structure; Firm Value; Panel Threshold Regression Model; SEASCRs.

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1. Introduction

Since the 60 years, the relationship between capital structure and firm value has been the subject of considerable debate. The results of both theoretically and in empirical research formed three different perspectives on this relationship: **(i) The capital structure is unrelated to firm value** (Modigliani and Miller (1958), Phillips and Sipahioglu (2004), Walaa Wahid ElKelish (2007), Pornsit Jiraporn and Yixin Liu (2008)); **(ii) The capital structure is related positive or negative to firm value** (Modigliani and Miller (1963), Miller (1977), Myers and Majluf (1984), Joshua Abor (2005), R. Zeitun et al.(2007), Onaolapo et al.(2010), Ali Saeedi et al.(2011), Wenjuan Ruan et al.(2011), Nour Abu-Rub (2012), Abdul Ghafoor Khan (2012), Zuraidah Ahmad et al.(2012)). The results of these studies indicate that the enterprise value is a linear function of capital structure, means that the slope of the enterprise value is constant in all the different debt ratios. Means that regression functions are identical across all observations in a

sample; **(iii) *There exists an optimal capital structure for each enterprise*** (Myers (1977, 1984), Feng-Li Lin (2007), Chien-Chung Nieh et al.(2008), Yu-Shu Cheng et al.(2010), Cuong and Canh (2012), Ahmad and Abdullah (2013)).

The South Central region of Vietnam stretches across 7 provinces and one coastal city, from Da Nang city to Binh Thuan province. This is the area where Seafood processing sector is the one of the most prominent sector of Vietnam that significantly contributes towards the economy in terms of creating employment, exports and its contribution in GDP. Characteristics of area's seafood processing enterprises are small-scale, newly-established, semi-manual labored, backward processing technology. The number of listed companies on the stock market is limited. Further, they present low profitability, high bankruptcy risk due to continuous natural disasters, output markets of numerous barriers, limited capital and so on. During 2010–2012, with the increase of interest rates, financial costs have significantly gone up in this years, resulting in decreasing profit of the firms, many businesses have closed and declared bankruptcy.

From the above practices, study the effect of capital structure on firm value for SEASCRs will help the enterprises making the decisions of enterprise capital restructuring more suitable. Specifically, how to use debt reasonably, in which case the increasing debt is effective, in which case the debt limit to reduce risk, reduce the risk of damage to enterprises. It is, therefore, of a particular, interest to investigate the relationship between capital structure and firm value in a sample of SEASCRs.

In this study, for the purpose of indicating the extent of capital structure, the debt will have a positive effect, increasing enterprise value; the extent of capital structure, the debt will have negative effects, reducing the value of the enterprise. This research applies the threshold regression model of Hansen (1999) to construct the threshold regression model to investigate the effect of capital structure on firm value for Seafood Processing Enterprises in the South Central Region of Vietnam.

The paper is divided into six sections. The next section reviews the results of previous theoretical and empirical research. The third section provides the sample data and the variables. The fourth section discusses the methodology. Section 5 discusses the empirical results, and the final section summarizes the key findings and implications.

2. Literature Review

The capital structure of a firm concerns the mixture of debt and equity the firm uses in its operation. The relationship between capital structure and firm value has been the subject of considerable debate, both theoretically and in empirical research. Through out the literature, debates have focused on whether there is an optimum capital structure for an individual firm or whether the proportion or level of debt usage is irrelevant or relevant to the firm's value.

2.1. Theoretical Literature

The debates on the relevance of capital structure to firm value has progressed from academic model to practical reality since Modigliani & Miller's research (1958). In a frictionless and perfect markets world, the irrelevant capital structure of Modigliani and Miller (1958) argued that firm value was independent of firm capital structure, and there was no optimal capital structure for a specific firm. However, Modigliani and Miller's (1958) perfect market

assumptions: such as no transaction costs, no taxes, symmetric information and identical borrowing rates, and risk free debt, were contradictory to the operations in the real world.

In their subsequent paper, Modigliani and Miller (1963) relaxed their assumption by incorporating corporate tax benefits as determinants of the capital structure of firms. The key feature of taxation is the recognition of interest as a tax-deductible expense. A firm that pays taxes receives a partially offsetting interest “tax-shield” in the nature of lower taxes paid. In other words, the firm value is increased through the use of debt in the capital structure, due to the tax deductibility of interest payments on debt. This is a tacit admission in which capital structure affects firm value. Consequently, as Modigliani and Miller (1963) proposed, firms should use as much debt capital as possible to maximize their value. In analogous to Modigliani and Miller’s (1963) propositions, Miller (1977) incorporated both corporate taxes and personal taxes into his model. According to Miller (1977), the value of the firm depends on the relative level of each tax rate, compared with the other two. Miller (1977) indicated that relative level of each tax rate determines firm value, and that the gain from employing debt may be smaller than what was suggested in Modigliani and Miller (1963).

The pecking order theory proposed by Myers and Majluf (1984), suggests that there is a hierarchy of firm preferences with regard to the financing of their investments and that there is no well-defined target debt ratio. The conclusion drawn from the pecking order theory is that there is a hierarchy of firm preferences with respect to the financing of their investments. This theory suggests that firms finance their needs, initially by using internally generated funds, i.e. undistributed earnings, where there is no existence of information asymmetry, next by less risky debt if additional funds are needed and lastly by risky external equity issue to cover any remaining capital requirements. The order of preferences reflects relative costs of finance to vary between the different sources of finance. Therefore, the pecking order theory indicates a negative relationship between profitability and debt.

The static Trade-off theory was developed by Myers in 1977. Myers (1977, 1984) suggests that the optimal capital structure does exist. A value-maximizing firm will find an optimal capital structure by trading off benefits and costs of debt financing. Therefore, it values the company as the value of the firm if unlevered plus the present value of the tax shield minus the present value of bankruptcy and agency costs.

2.2. Empirical Literature

Table 1 shows the summary of the findings of previous authors related to the impact of capital structure on firm value.

Table 1: Previous findings on the impact of capital structure on firm value

Author	Findings	Country/Markets
The capital structure is unrelated to firm value		
Phillips <i>et al.</i> (2004)	Empirical analysis revealed no significant relationship between the level of debt found in the capital structure (TD/TA) and financial performance (Tobin's Q).	UK
Walaah Wahid Elkelish (2007)	Findings suggest that debt to equity ratio (TD/TE) has no impact on firm value (measured according to the Discounted Cash Flow model in perpetuity).	United Arab Emirates
Pornsit Jiraporn <i>et al.</i> (2008)	The results demonstrate no significant adverse impact on firm value (Tobin's Q, ROA) due to excess leverage (TD/TA).	USA
The capital structure is related positive or negative to firm value		
Joshua Abor (2005)	Found a positive relationship between capital structure (SD/TA, TD/TA) and firm performance (ROE). However, a negative relationship between capital structure (LD/TA) and ROE was found.	Ghana
R. Zeitun <i>et al.</i> (2007)	Found a negative relationship between capital structure (SD/TA, LD/TA, TD/TA) and corporate performance (ROA, Tobin's Q).	Jordan
Onaolapo <i>et al.</i> (2010)	Found a negative relationship between capital structure (TD/TA) and firm performance (ROA, ROE).	Nigeria
Ali Saeedi <i>et al.</i> (2011)	Findings suggest that firm performance (EPS, Tobin's Q) is significantly and positively associated with capital structure (SD/TA, LD/TA, TD/TA), while report a negative relation between capital structure and ROA. Moreover, there is no significant relationship between ROE and capital structure.	Iran
Wenjuan Ruan <i>et al.</i> (2011)	Found that managerial ownership negatively impacts the ratio of total debt to total assets and the ratio of total debt to total assets negatively impacts firm value (Tobin's Q).	China
Nour Abu-Rub (2012)	Found a positive relationship between capital structure (SD/TA, LD/TA, TD/TA, TD/TE) and firm performance (ROE, ROA, EPS, MBVR and Tobin's Q).	Palestine
Zuraidah Ahmad <i>et al.</i> (2012)	Found a negative relationship between capital structure (SD/TA, TD/TA) and firm performance (ROE, ROA). However, a positive relationship between capital structure (LD/TA) and ROE was found.	Malaysia
Abdul Ghafoor Khan (2012)	Found a negative relationship between capital structure (SD/TA, TD/TA) and firm performance (ROA, Tobin's Q). Moreover, there is no significant relationship between ROE and capital structure.	Pakistan
There exists an optimal capital structure for each enterprise		
Feng-Li Lin (2007)	Found that the optimal range of debt ratio (TD/TA) between 48.92% and 49.55% that increases firm value (Tobin's Q).	Taiwan
Chien-Chung Nieh <i>et al.</i> (2008)	Found that the optimal range of debt ratio (TD/TA) between 12.37% and 28.70% that increases firm value (ROE, EPS).	Taiwan
Yu-Shu Cheng <i>et al.</i> (2010)	Found that the optimal debt ratio (TD/TA) of less than 70.48% enhances firm value (ROE).	China
Cuong and Canh (2012)	Found that the optimal debt ratio (TD/TA) of less than 59.27% enhances firm value (ROE).	Vietnam
Ahmad and Abdullah (2013)	Found that the optimal leverage (ratio of total liabilities to total assets) of less than 64.33% that increases firm value (ROE).	Malaysia

Notes: ROA = the return on assets; ROE = return on equity; Tobin's Q = (Market value of equity + book value of debt) / book value of assets; MBVR = Market value of equity / Book value of equity; EPS = net income / outstanding shares; SD/TA = short-term debt / total assets; LD/TA = Long-term debt / total assets; TD/TA = total debt / total assets; TD/TE = Total debt / total equity.

In summary, there is no universal theory of the debt-equity choice. Different views have been put forward regarding the financing choice. This research applies the threshold regression model of Hansen (1999) to construct the threshold regression model to investigate the effect of capital structure on firm value for Seafood Processing Enterprises in the South Central Region of Vietnam.

3. Data and Variables

3.1. Sample Description

The sample of the study consists of 90 unlisted Seafood processing enterprises in the South Central region of Vietnam from 2005–2011. For some enterprises, collected data consists of balance sheets and annual business outcome reports. With the enterprises are collected across a period of 7 years, this study has 630 observations.

3.2. Variables

3.2.1. Firm Value

Firm value has been measured through the accounting and market based proxies i.e. ROA, ROE, MBVR, Tobin's Q and EPS by the previous studies. However, characteristics of Seafood processing enterprises in the South Central region of Vietnam are unlisted enterprises. The aforementioned argument suggests that the suitable firm value should be based on book value. This study has used book value of equity plus long- term debt supported by the studies of Samuel Antwi *et al.* (2012), OGBULU *et al.* (2012) and return on equity supported by the studies of Chien-Chung Nieh *et al.* (2008), Yu-Shu Cheng *et al.* (2010), Cuong and Canh (2012), Ahmad and Abdullah (2013) as proxy of firm value. The measurement of firm value defined as below:

$$\text{BVE} = \text{Book Value of Equity} + \text{Long- term Debt}$$

$$\text{ROE} = \frac{\text{Book value of Earnings after taxes}}{\text{Book value of Equity}}$$

3.2.2. Threshold and explanatory variables

There are two categories of explanatory variables in my panel data and threshold regression model. One is the threshold variable, which is the key variable used to assess the optimal capital structure of a firm and to capture the threshold effect of debt on firm value. The threshold variable is a variable, when threshold variable is bigger or smaller than threshold value (γ), the samples can be divided into two groups, which can be expressed in different slopes β_1 and β_2 . The explanatory variable is a variable, reflecting its impact on the dependent variable. In the threshold regression model, explanatory variable impacts are not fixed but depends on the threshold value of the threshold variable. According to the "Trade-off Theory" of capital structure and the threshold regression model of Hansen (1999), the author assume that there exists an optimal capital structure for each Seafood Processing Enterprises in the South Central Region of Vietnam.

Following Feng-Li Lin (2007), Chien-Chung Nieh *et al.* (2008), Yu-Shu Cheng *et al.* (2010), Cuong and Canh (2012), the author use total debt to total assets (TD/TA) to represent the capital structure. It is the explanatory variable and also the threshold variable. The measurement of capital structure defined as below:

$$TD/TA = \frac{\text{Book value of Total debt}}{\text{Book value of Total assets}}$$

3.2.3. Control variables

On the basis of previous studies, two control variables are used in this study includes enterprise size and firm's growth. Following section will analyze interconnection between those variables relative to firm value.

Enterprise size (SIZE) is considered one determinant of firm value. Joshua Abor (2005) suggest that enterprises of higher size generally have higher profitability. This suggests a positive relationship between the control variable (enterprise size) and profitability. On the other hand, researches by Yu-Shu Cheng *et al.* (2010) suggest that enterprises of higher size generally have lower firm value. This would suggest a negative relationship between the control variable (firm size) and firm value. Regard to this variable, the author suggest that enterprise size might have either positive or negative relationship with firm value. To measure enterprise size, Yu-Shu Cheng *et al.* (2010), Cuong and Canh (2012) have used natural log of total asses to measure the firm size. This study has also used natural log of total assets as proxy of firm size as below:

$$SIZE = \text{Ln}(\text{Book value of Total assets})$$

Growth (SG) is considered to be a factor related to firm value. Joshua Abor (2005) suggest that enterprises of higher growth opportunities generally have higher profitability. Additionally, researches by Chien-Chung Nieh *et al.* (2008), Yu-Shu Cheng *et al.* (2010) suggest that enterprises of higher growth rate on operating sales generally have higher firm value. Regard to this variable, the author suggests a positive relationship between the control variable (growth) and firm value. To measure growth, previous studies have reported % change in total assets and % change in annual sales as measure of firm's growth rate. This study has used % change in annual sales as measure of growth rate of sales supported by the studies of Yu-Shu Cheng *et al.* (2010), Cuong and Canh (2012). The measurement of growth ratio defined as below:

$$SG = \frac{\text{Total Annual revenue (t)} - \text{Total Annual revenue (t-1)}}{\text{Total Annual revenue (t-1)}}$$

4. Research Methodologies

According to the "Trade-off Theory" of capital structure, when debt ratio increases, the interest tax shield increases. However, on the other side, leverage related costs increase to offset the positive effect of debt ratio to the firm value. Thus, this paper aims at examining whether threshold effect exists between the capital structure and value. The author assume that there exists an optimal debt ratio, and try to use threshold model to estimate this ratio, which can capture

the relationship between capital structure and firm value as well as help financial managers make decisions of enterprise capital structuring more suitably. This research applies the threshold regression model of Hansen (1999) and refer to the empirical study of Chien-Chung Nieh *et al.* (2008), Yu-Shu Cheng *et al.* (2010), Cuong and Canh (2012) to construct the panel threshold regression model to investigate the effect of capital structure on firm value for Seafood Processing Enterprises in the South Central Region of Vietnam. The author constructed the following single threshold model:

$$FV_{it} = \begin{cases} \mu_i + \theta' H_{it} + \beta_1 (TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} \leq \gamma \\ \mu_i + \theta' H_{it} + \beta_2 (TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} > \gamma \end{cases}$$

Where $\theta' = (\theta_1, \theta_2)'$ and $H_{it} = (SIZE_{it}, SG_{it})'$. $(TD/TA)_{it}$ is the explanatory variable and also the threshold variable; FV_{it} represents firm value (ROE_{it} and BVE_{it}); γ is the hypothesized specific threshold value. θ_1, θ_2 represent the coefficient estimates of the control variables. μ_i is a given fixed effect used to grasp the heterogeneity of different companies under different operating conditions; β_1 is the threshold coefficient when the threshold value is lower than γ ; β_2 is the threshold coefficient when the threshold value is higher than γ ; Error item ε_{it} must comply with the iid assumptions ($\varepsilon_{it} \sim iid(0, \sigma^2)$), where the average is 0, and variance is σ^2 ; i represents different firms and t represents different periods.

For the estimation procedures, the author first eliminate the individual effect μ_i using the “within Transformation” estimation techniques in the traditional fixed effect model of panel data. By using the ordinary least squares and minimizing the concentrated sum of squares of errors, $S_1(\gamma)$, the author can obtain the estimators of our threshold value and the residual variance, $\hat{\gamma}$ and $\hat{\sigma}^2$, respectively.

For the testing procedures, first, the author have to go on to test the null hypothesis of no threshold effect, $H_0: \beta_1 = \beta_2$, which can be based on the likelihood ratio test: $F_1 = (S_0 - S_1(\hat{\gamma}))/\hat{\sigma}^2$, where S_0 and $S_1(\hat{\gamma})$ are sum of squared errors under null and alternative hypotheses, respectively. However, as the asymptotic distribution of F_1 is non-standard, the author use the procedure of bootstrap to construct the critical values and P-value.

Upon the existence of threshold effect, $H_0: \beta_1 \neq \beta_2$, the author should test for the asymptotic distribution of threshold estimate, $H_0: \gamma = \gamma_0$, and adopt the likelihood ratio test: $LR_1 = (S_1(\gamma) - S_1(\hat{\gamma}))/\hat{\sigma}^2$ with the asymptotic confidence intervals: $c(\alpha) = -2\log(1 - \sqrt{1 - \alpha})$.

If there exist double thresholds, the model can be modified as:

$$FV_{it} = \begin{cases} \mu_i + \theta' H_{it} + \beta_1 (TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} \leq \gamma_1 \\ \mu_i + \theta' H_{it} + \beta_2 (TD/TA)_{it} + \varepsilon_{it}, & \text{if } \gamma_1 < (TD/TA)_{it} \leq \gamma_2 \\ \mu_i + \theta' H_{it} + \beta_3 (TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} > \gamma_2 \end{cases}$$

Where threshold value $\gamma_1 < \gamma_2$. This can be extended to multiple $(\gamma_1, \gamma_2, \gamma_3, \dots, \gamma_n)$.

5. Empirical Results

5.1. Descriptive Statistics

Table 2 represents the descriptive statistics of all variable in this study. Financial information was collected from balance sheets and annual business outcome reports of 90 unlisted Seafood Processing Enterprises in the South Central region of Vietnam during 2005–2011 period.

Results of descriptive statistics in table 2 show that: Firm value by average BVE and ROE of SEASCRs are 22.9077 (equivalent to 32.14 billions VND) and 2.92%. The mean of debt ratio (TD/TA) of SEASCRs is 59.39%. Size by average assets (SIZE) of SEASCRs is 23.7785 (equivalent to 69.86 billions VND). Growth rate of operating sales (SG) of SEASCRs is 5.28%. Table 2 also includes median value, minimum value, maximum value, standard deviation and no. of observations.

Table 2. Descriptive Statistics

Variables	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
BVE _{it}	630	22.9077	22.8343	19.7322	28.2582	1.4824
ROE _{it}	630	0.0292	0.0303	-1.5442	0.8785	0.2104
(TD/TA) _{it}	630	0.5939	0.6397	0.0192	0.9832	0.2326
SIZE _{it}	630	23.7785	23.7311	20.3455	28.5690	1.5208
SG _{it}	630	0.0528	0.0832	-2.3901	2.6893	0.5033

Notes: Std. Dev. denotes standard deviation, ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

5.2. Panel unit root test results

Hansen's (1999) panel threshold regression model is an extension of the traditional least squared estimation method, in fact. It requires that variables considered in the model need to be stationary in order to avoid the so-called spurious regression. Thus, the unit root test is first processed in this study. The null hypothesis of non-stationary versus the alternative in which variable is stationary, was tested using the group mean panel unit root test.

Table 3. Panel unit-root test results

Variables	LLC		IPS	
	t-statistic	P-value	z-statistic	P-value
BVE _{it}	-21,6564	0.0000***	-3,9952	0.0000***
ROE _{it}	-9,1806	0.0000***	-5,5745	0.0000***
(TD/TA) _{it}	-18,0200	0.0000***	-2,7747	0.0000***
SIZE _{it}	-14,2492	0.0000***	-3,9675	0.0000***
SG _{it}	-20,9811	0.0000***	-7,3985	0.0000***

Notes: LLC and IPS represent the Levin et al. (2002) and Im et al. (2003) panel unit-root test, respectively. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

Table 3 represents the result of Levin et al. (2002) and IPS ADF (Im et al., 2003) and shows that all variables are stationary at level as P-values are indicating the rejection of null hypothesis. Accordingly, the author proceed with full analysis.

5.3. Tests of threshold effect

In this study, the author follow the bootstrap method proposed by Hansen (1999) to obtain the approximations of the F statistics and then calculate the p-values. The bootstrap procedure is repeated 1000 times for each of the three panel threshold tests. The F statistics contains F1, F2 and F3 to assess the null hypotheses of none, one and two thresholds, respectively. Table 4 presents the test statistics F1, F2, and F3, along with their bootstrap P-values.

Table 4. Tests for threshold effects between the debt ratio and proxy variables for firm value

Firm value variables	Threshold value			F-statistic		Test critical values		
				F-stat	P-value	1%	5%	10%
Single threshold effect test								
BVE _{it}	0.6381			211.30	0.00***	24.13	15.95	13.58
ROE _{it}	0.8998			35.08	0.00***	22.35	18.95	15.17
Double threshold effect test								
BVE _{it}	0.5739	0.7867		97.20	0.00***	23.08	16.81	13.97
ROE _{it}	0.5793	0.8998		20.31	0.03**	24.54	15.96	13.60
Triple threshold effect test								
BVE _{it}	0.5739	0.7867	0.9230	63.08	0.00***	24.08	16.18	13.46
ROE _{it}	0.5396	0.5793	0.8998	9.97	0.19	20.08	13.50	12.03

Notes: F-statistics and p-values are from repeating bootstrap procedures 1000 times for each of the three bootstrap tests. ***, ** and * indicate significance at the 1, 5 and 10% level, respectively.

Results of tests for threshold effects between the debt ratio and proxy variables for firm value in table 4 show that:

Regarding BVE as a proxy for firm value, the single threshold effect is first tested to see if it exists. By using bootstrap to make 1000 times, F-tatistics (F1) of 211.30 and P-value of 0.00 are respectively yielded. They show significance under 1% significant level and reject the null hypothesis of no threshold effect. Likewise, bootstrap is used to make 1000 times and respectively yields F-statistics (F2) of 97.20 and P-value of 0.00. They show significance under a 1% significant level and reject the null hypothesis of one threshold. Finally, triple-threshold effect is tested to see if it exists. Similarly, bootstrap is used to make 1000 times and respective yields F-statistics (F3) of 63.08 and P-value of 0.00. The results reject the null hypothesis of two thresholds, suggesting the possibility of three thresholds. In conclusion, the aforementioned statistic analysis articulately shows that an asymmetric relationship of three thresholds in four regimes is significantly formed. Table 4 also presents the estimated values of three thresholds, which are 57.39%, 78.67% and 92.30%, respectively. All observations are objectively and passively split into four regimes depending on whether the threshold variable it (TD/TA)_{it} is smaller or larger than the threshold value ($\hat{\gamma}_1, \hat{\gamma}_2, \hat{\gamma}_3$). Accordingly, the author define four regimes formed by three threshold values to be low debt, medium debt, high debt

and very high debt if their debt ratio within the ranges (0.00% – 57.39%), (57.39% – 78.67%), (78.67% – 92.30%) and exceed 92.30%. The figure of appendix 1 shows the confidence interval construction in single threshold, double threshold and triple threshold.

Regarding ROE as proxy of firm value, the single threshold effect is first tested to see if it exists. By using bootstrap to make 1000 times, F-tatistics (F1) of 35.08 and P-value of 0.00 are respectively yielded. They show significance under 1% significant level and reject the null hypothesis of no threshold effect. Likewise, bootstrap is used to make 1000 times and respectively yields F-statistics (F2) of 20.31 and P-value of 0.03. They show significance under a 5% significant level and reject the null hypothesis of one threshold. Finally, triple-threshold effect is tested to see if it exists. Similarly, bootstrap is used to make 1000 times and respective yields F-statistics (F3) of 9.97 and P-value of 0.19. The results reject the null hypothesis of three thresholds. In conclusion, the aforementioned statistic analysis articulately shows that an asymmetric relationship of two thresholds in three regimes is significantly formed. Table 4 also presents the estimated values of two thresholds, which are 57.93% and 89.98%, respectively. All observations are objectively and passively split into three regimes depending on whether the threshold variable it (TD/TA)_{it} is smaller or larger than the threshold value ($\hat{\gamma}_1, \hat{\gamma}_2$). Accordingly, the author define three regimes formed by two threshold values to be debt if their debt ratio within the ranges (0.00% – 57.93%), (57.93% – 89.98%) and exceed 89.98%. The figure of appendix 2 shows the confidence interval construction in single threshold, double threshold.

Table 5. Estimated coefficients of firm value for each proxy variable for the firm value

Firm value variables	Coefficients	Estimated value	OLS SE	White SE	t _{OLS}	t _{White}
BVE _{it}	$\hat{\beta}_1$	0.2963	0.1053	0.1085	2.8139***	2.7309***
	$\hat{\beta}_2$	-0.4109	0.0971	0.0980	-4.2317***	-4.1929***
	$\hat{\beta}_3$	-0.9661	0.1013	0.1070	-9.5370***	-9.0290***
	$\hat{\beta}_4$	-1.6929	0.1413	0.1906	-11.9809***	-8.8820***
ROE _{it}	$\hat{\beta}_1$	0.1488	0.0686	0.0745	2.1691**	1.9978**
	$\hat{\beta}_2$	-0.0043	0.0624	0.0591	-0.0692	-0.0731
	$\hat{\beta}_3$	-0.3128	0.0841	0.1176	-3.7185***	-2.6606***

Notes: $\hat{\beta}_1, \hat{\beta}_2, \hat{\beta}_3$ are the coefficient estimates that are smaller and larger than the threshold value γ . OLS SE and White SE represent conventional OLS SEs (considering homoscedasticity) and White-corrected SEs (considering heteroscedasticity), respectively. ***, ** and * indicate significance at the 1, 5 and 10% level, respectively.

Table 5 shows the estimated coefficients, conventional OLS standard errors, and White-corrected standard errors for each proxy variable for the firm value. The results in table 5 show that:

Regarding BVE as a proxy for firm value, in the first regime when debt ratio is less than 57.39%, the estimated coefficient of BVE ($\hat{\beta}_1 = 0.2963$) is positive and significant at the 1% level, indicating that BVE increases by 0.2963% with an increase of 1% in debt ratio. The negative effects of debt on firm value are found in the second, third and last regime, respectively. In the second regime, where the debt ratio is between 57.39% and 78.67%, the estimated coefficient of BVE ($\hat{\beta}_2 = -0.4109$) is negative and significant at the 1% level, indicating that BVE decreases by

0.4109% with an increase of 1% in debt ratio. In the third regime, where the debt ratio is between 78.67% and 92.30%, the estimated coefficient of BVE ($\hat{\beta}_3 = -0.9661$) is negative and significant at the 1% level, indicating that BVE decreases by 0.9661% with an increase of 1% in debt ratio. In the last regime, where the debt ratio is greater than 92.30%, the estimated coefficient of BVE ($\hat{\beta}_4 = -1.6929$) is negative and significant at the 1% level, indicating that BVE decreases by 1.6929% with an increase of 1% in debt ratio.

Regarding ROE as a proxy for firm value, in the first regime when debt ratio is less than 57.93%, the estimated coefficient of BVE ($\hat{\beta}_1 = 0.1488$) is positive and significant at the 5% level, indicating that ROE increases by 0.1488% with an increase of 1% in debt ratio. The negative effects of debt on firm value are found in the second and last regime, respectively. In the second regime, where the debt ratio is between 57.93% and 89.98%, the estimated coefficient of ROE ($\hat{\beta}_2 = -0.0043$) is negative and insignificant, indicating that there is no relationship between debt ratio and firm value. In the third regime, where the debt ratio is greater than 89.98%, the estimated coefficient of ROE ($\hat{\beta}_3 = -0.3128$) is negative and significant at the 1% level, indicating that ROE decreases by 0.3128% with an increase of 1% in debt ratio.

Therefore, the results clearly suggest that the relationship between debt ratio and firm value (that is, the slope value) varies in accordance with different changes in debt structure, and that debt structure has a nonlinear relationship with firm value.

Table 6. Estimated coefficients of control variables for each proxy variable for the firm value

Firm value variables	Coefficients	Estimated value	OLS SE	White SE	t _{OLS}	t _{White}
BVE _{it}	$\hat{\theta}_1$	0.9834	0.0261	0.0339	37.6782***	29.0088***
	$\hat{\theta}_2$	0.0017	0.0231	0.0242	0.0736	0.0702
ROE _{it}	$\hat{\theta}_1$	0.0259	0.0171	0.0148	1.5174	1.7509*
	$\hat{\theta}_2$	0.0189	0.0151	0.0142	1.2492	1.3272

Notes: $\hat{\theta}_1$, $\hat{\theta}_2$ represent estimated coefficients of firm size, growth rate of operating sales. OLS SE and White SE represent conventional OLS SEs (considering homoscedasticity) and White-corrected SEs (considering heteroscedasticity), respectively. ***, ** and * indicate significance at the 1, 5 and 10% level, respectively.

Table 6 presents the estimated coefficients of two control variables, conventional OLS standard errors, and White-corrected standard errors for each proxy variable for the firm value. The results in table 6 show that:

Regarding BVE as a proxy for firm value, the estimated coefficient of firm size ($\hat{\theta}_1 = 0.9834$) is positive and significant at the 1% level, indicating that BVE increases by 0.9834% with an increase of 1% in firm size. The estimated coefficient of growth rate of operating sales ($\hat{\theta}_2 = 0.0017$) is positive and is insignificant, indicating that there is no relationship between growth rate of operating sales and firm value.

Regarding ROE as a proxy for firm value, the estimated coefficient of firm size ($\hat{\theta}_1 = 0.0259$) is positive and significant at the 10% level, indicating that ROE increases by 0.0259% with an increase of 1% in firm size. The

estimated coefficient of growth rate of operating sales ($\hat{\theta}_2 = 0.0189$) is positive and is insignificant, indicating that there is no relationship between growth rate of operating sales and firm value.

Therefore, the results clearly suggest that, the size of total assets have a significantly positive effect on firm value, implying that the greater the size of total assets, that a firm have, the higher its firm value. Moreover, the growth rate of operating sales are shown to have no significant effect on firm value. This implies that expanding growth rate of operating sales does not necessarily increase firm value.

5.4. Estimated Model

Based on empirical findings, following is the estimated model when total debt to total assets (TD/TA) are taken as proxy of capital structure and BVE as a proxy for firm value:

$$BVE_{it} = \begin{cases} \mu_i + 0.9834 SIZE_{it} + 0.0017 SG_{it} + 0.2963(TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} \leq 0.5739 \\ \mu_i + 0.9834 SIZE_{it} + 0.0017 SG_{it} - 0.4109(TD/TA)_{it} + \varepsilon_{it}, & \text{if } 0.5739 < (TD/TA)_{it} \leq 0.7867 \\ \mu_i + 0.9834 SIZE_{it} + 0.0017 SG_{it} - 0.9661(TD/TA)_{it} + \varepsilon_{it}, & \text{if } 0.7867 < (TD/TA)_{it} \leq 0.9230 \\ \mu_i + 0.9834 SIZE_{it} + 0.0017 SG_{it} - 1.6929(TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} > 0.9230 \end{cases}$$

The empirical results strongly indicate that triple threshold effect exists between debt ratio and firm value when BVE is selected to proxy firm value. Besides, the coefficient is positive when debt ratio is less than 57.39%, which implies that debt financing can improve firm value. The coefficient is negative and presents a decreasing trend when the debt ratio is between 57.39% and 78.67% or between 78.67% and 92.30% or above 92.30%, implying that, in that regime, a further increase in debt financing, deteriorates firm value.

Following is the estimated model when total debt to total assets (TD/TA) are taken as proxy of capital structure and ROE as a proxy for firm value:

$$ROE_{it} = \begin{cases} \mu_i + 0.0259 SIZE_{it} + 0.0189 SG_{it} + 0.1488(TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} \leq 0.5793 \\ \mu_i + 0.0259 SIZE_{it} + 0.0189 SG_{it} - 0.0043(TD/TA)_{it} + \varepsilon_{it}, & \text{if } 0.5793 < (TD/TA)_{it} \leq 0.8998 \\ \mu_i + 0.0259 SIZE_{it} + 0.0189 SG_{it} - 0.3128(TD/TA)_{it} + \varepsilon_{it}, & \text{if } (TD/TA)_{it} > 0.8998 \end{cases}$$

When ROE is selected to proxy firm value, the result shows that there exists double thresholds effect between debt ratio and firm value. Besides, the coefficient is positive when debt ratio is less than 57.93%, which implies that debt financing can improve firm value. The coefficient is negative and presents a decreasing trend when the debt ratio is between 57.93% and 89.98% or above 89.98%, implying that, in that regime, a further increase in debt financing, deteriorates firm value.

From the above results, the author may conclude that the relationship between capital structure and firm value has a nonlinear relationship represents an convex Parapol shape. In addition, it is concluded that there exists an optimal debt ratio is less than 57.39% that increases firm value. These findings are consistent with the trade-off theory (Myers, 1977), Chien-Chung Nieh *et al.* (2008), Yu-Shu Cheng *et al.* (2010), Cuong and Canh (2012), Ahmad and Abdullah (2013) for which firm may search a “balance” that the interest tax shield is equal to the incremental costs through debt financing. The size of total assets have a significantly positive effect on firm value, implying that the greater the size

of total assets, that a firm have, the higher its firm value. However, the growth rate of operating sales are shown to have no significant effect on firm value. This implies that expanding growth rate of operating sales does not necessarily increase firm value.

6. Conclusions and Implications

The capital structure decision is crucial for any business organization. The decision is important because of the need to maximize returns to various organizational constituencies, and also because of the impact such a decision has on an organization's ability to deal with its competitive environment. This study uses the advanced panel threshold regression model to examine the panel threshold effect of capital structure on firm value among 90 unlisted Seafood Processing Enterprises in the South Central region of Vietnam during 2005–2011 period. The findings of the study shows the presence of triple threshold effect of debt ratio on firm value when BVE is selected to proxy firm value. However, when ROE is selected to proxy firm value, the result shows that there exists double thresholds effect between debt ratio and firm value. From these results, the author may conclude that the relationship between capital structure and firm value has a nonlinear relationship represents an convex Parapol shape. In addition, this study provides new evidence on the existence of threshold debt ratio of 57.39 % for unlisted Seafood Processing Enterprises in the South Central region of Vietnam. This result supports the trade-off theory and the findings of previous authors, also as author's hypothesis in this study, implying that there exists an optimal capital structure for each enterprise. For the control variables, according to empirical results, the size of total assets have a significantly positive effect on firm value. This finding supports author's hypothesis in this study, implying that the greater the size of total assets, that a firm have, the higher its firm value. However, the growth rate of operating sales are shown to have no significant effect on firm value. This finding not supports author's hypothesis in this study, implying that expanding growth rate of operating sales does not necessarily increase firm value.

From the above mentioned findings, there will be several implications for Seafood Processing Enterprises in the South Central region of Vietnam in using financial leverage. *Firstly*, SEASCRs should not use loans over 57.39%. To ensure and enhance the firm value, the scope of the optimal debt ratio should be less than 57.39%. *Secondly*, for SEASCRs currently have debt ratios greater than 57.39%, managers can apply the models that are developed here in order to set a target level, and then gradually move towards it so as to maximize firm value. *Thirdly*, the firms using debt below optimal range may employ more debt to get the benefits of tax shield that increases the firm value.

Financial statements of most unlisted Seafood Processing Enterprises in the South Central region of Vietnam are not audited. The availability and reliability of financial data was a major limitation for this research. Therefore, the enterprise value is not measured by the market value. In the future, the enterprise value will be measured by market value. Future research could also consider the effect of specific industries, ownership and market variables, with the aim of examining the effect of such variables on the firm's value in Vietnam.

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Appendix 1. Tests for threshold effects between capital structure (TD/TA) and firm value (BVE)

Appendix 2. Tests for threshold effects between capital structure (TD/TA) and firm value (ROE)