sustainability

MDPI

Article

Determinants of the Capital Structure of the Oil and Gas Industry in Malaysia: The Moderating Role of Earnings Volatility

Maran Marimuthu [1,*], Hana Halini Hamzah [1,*] and Romana Bangash [2]

[1] Department of Management and Humanities, Universiti Teknologi PETRONAS (UTP), Seri Iskandar 32610, Perak Darul Ridzuan, Malaysia
[2] Institute of Management Sciences (IM | Sciences), Peshawar 25000, Pakistan; romana.bangash@imsciences.edu.pk
* Correspondence: maran.marimuthu@utp.edu.my (M.M.); hana_16005304@utp.edu.my (H.H.H.)

Abstract: This paper examines the relationship between firm-specific factors and the capital structure of the oil and gas (O&G) industry in Malaysia.. In addition, this paper adds to the literature by investigating the moderating effect of earnings volatility on the relationship between firm-specific factors and capital structure. Random effect models with cluster-robust standard errors were used to analyze this relationship. Using the secondary data from 30 O&G firms listed on the main market of Bursa Malaysia collected between 2010 and 2019 (10 years), the results show that profitability, asset tangibility, liquidity, and firm size significantly impact the capital structure of the O&G industry in Malaysia. However, growth opportunities, non-debt tax shields, and firm age had no significant impact. In addition to this, earnings volatility significantly moderated the relationship between asset tangibility and leverage. In short, when earnings volatility acts as a moderating variable, the relationship between asset tangibility, which is otherwise positive without moderation, turns negative. This study is useful for policymakers in the O&G industry in Malaysia and will help their managers to decide on capital structure for sustainable growth.

Keywords: determinants of capital structure; firm-specific factors; earnings volatility; oil and gas industry; Malaysia

Citation: Marimuthu, M.; Hamzah, H.H.; Bangash, R. Determinants of the Capital Structure of the Oil and Gas Industry in Malaysia: The Moderating Role of Earnings Volatility. *Sustainability* **2023**, *15*, 16568. https://doi.org/10.3390/su152416568

Academic Editor: Frank Li

Received: 25 July 2023
Revised: 13 November 2023
Accepted: 22 November 2023
Published: 5 December 2023

1. Introduction

The study of capital structure has garnered significant attention in the field of finance. According to Myers [1], the study of this topic involves explaining the combination of different securities, including debt and equity, that firms issue for real investment. However, how firms decide the fraction of debt and equity remains a subject of debate among scholars. This is because empirical studies that look at the determinants of capital structure have produced conflicting findings: some have shown a positive relationship, others have shown a negative relation, while some have shown no relationships at all. These contradictions in results highlight the complexity of the factors influencing capital structure decisions and emphasize the need for further research in this area.

On top of that, previous empirical studies on the determinants of capital structure generally employed two distinct datasets: (1) focusing on combined industries such as non-financial industries or (2) focusing on a specific industry based on its characteristics as a sample. It is recognized that the impact of firm-specific factors varies between industries. Nevertheless, the majority of these empirical studies tend to focus on the combined industries, such as non-financial industries as the sample and ignore the unique characteristics of each industry. In particular, Kumar et al. [2] reported that 73% of past studies did not separate data based on industry classification. Consequently, the force behind the capital

structure of a particular industry, not least the oil and gas (O&G) industry, remains open for investigation; little is known from the point of view of the O&G industry.

A major difference between the O&G industry and non-O&G industries is that the former is commonly recognized as a highly capital-intensive industry. It requires huge capital for investment. In fact, the emergence of the "oil and gas 4.0" era further increases the capital requirements regarding the replacement of equipment and systems [3]. Hence, it is believed that the higher capital requirements of the O&G industry may affect its capital structure in a different way compared to non-O&G industries. This is because this particular industry generally supplements high capital requirements with debt [4]. The leverage level of the global O&G industry has notably increased, with the global debt reaching USD 2.5 trillion in 2014 [5]. Subsequently, it is becoming crucial to delve into the determinants of the capital structure of this industry to ensure its sustainable growth.

In this dynamic environment, understanding the determinants of capital structure is crucial for the O&G industry, especially in the Malaysian context. According to The World Bank [6], Malaysia has an upper-middle-income economy. Its financial institutions are comparable to other developed and developing countries. Surprisingly, Malaysia has a largedebt market. Malaysia's debt market (conventional and Islamic bonds) is larger than the stock market [7]. Remarkably, in 2019, Malaysia's Islamic bond (Sukuk), was the leading global issuance of Sukuk, with a share of 43.67% [8]. This signifies the vibrancy of the capital market in Malaysia and provides multiple sources of financing for the O&G industry. Nevertheless, a few studies [9,10] have revealed that the capital structure of the O&G industry in Malaysia negatively impacts firm performance. Without a doubt, capital structure is therefore a recurring problem for the O&G industry in Malaysia, and capital structure decisions will negatively affect the sustainability of this industry. Notwithstanding this financial instability, there are not many studies on the determinants of capital structure that specifically focus on the O&G industry within the Malaysian context.

On top of that, the O&G industry is always dealing with the unique challenge of highly volatile oil prices over time. The sudden fluctuations in oil prices can significantly impact the revenue and profitability of the industry, leading to volatility in its earnings [11]. According to Narayan and Nasiri [4], the downturn in oil prices exacerbated the burden of debt for firms, which puts the firms' profitability at risk. Therefore, we argued that this will lead to volatility in their earnings, and thus the impact of the determinants of capital structure during high earnings volatility may vary. However, surprisingly, prior studies have overlooked the role of earnings volatility as an intervening factor in determining capital structure.

Therefore, the primary focus of this paper is to examine the relationship between firm-specific factors and the capital structure of the O&G industry in Malaysia. More specifically, this paper aims to analyze how various firm-specific factors impact firms' capital structure decisions. Secondly, this study examines the moderating effects of earnings volatility on the relationship between firm-specific factors and capital structure. Capital structures are proxies by leverage and can be measured using a calculation of total debt to total assets, while firm-specific factors act as independent variables.

This study makes several significant contributions to the body of current knowledge. Firstly, it considerably contributes to the literature on capital structure by focusing on Malaysia's O&G industry. Secondly, it is among one of the first studies to considering moderating factors of earnings volatility in the relationship between firm-specific factors and capital structure, which have not previously been studied.

The paper is organized into several sections. In Section 2, we examine the relevant literature on factors influencing capital structure and develop hypotheses. In Section 3, we describe the employed methodologies. In Section 4, we present the results, followed by a discussion of the study's findings, and finally, in Section 5, we provide a conclusion to the study.

2. Literature Review

Numerous theories have been put forth to provide explanations for capital structure, but groundwork for contemporary capital structure theory can be attributed to Modigliani and Miller [12]. However, their groundbreaking study has sparked a great deal of disagreement among researchers, largely because they claim that a firm's value is unrelated to its capital structure. The theorem is based on a few assumptions—there are no taxes, no bankruptcy cost, no information asymmetry, and no agency cost—that deviate from the realities of the business world. Following that, several theories have been developed to explain capital structure. These include trade-off theories [13,14], pecking order theory [14], agency cost theory [15], and market timing theory [16].

The trade-off and pecking order theories have gained wide acceptance because of their capability to explain capital structure. However, these two theories have different arguments on the decision of capital structure. The trade-off theory posits that there exists an optimal capital structure that strikes a balance between the benefits and costs of debt. The benefits of debt include tax deductibility and the agency cost of equity, while the costs of debt are the bankruptcy cost and agency cost. As a result, firms try to strike a balance between the benefits and costs of debt in their capital structure. Meanwhile, the pecking order theory argues that firms have a strict hierarchical order of financing sources. This order begins with internal financing and is followed by external financing options. However, when external financing is necessary, firms typically prefer debt over equity. This hierarchical order is based on the information asymmetry between insiders (managers/shareholders) and outsiders (investors).

It has been shown by previous empirical studies that the most dominant factors influencing capital structure decisions are firm-specific factors [17]. Many studies, either conducted in developed or developing countries, tend to focus on factors that are specific to the firms' characteristics—firm-specific factors. Booth et al. [18] reported that the factors which affect developed countries also affect developing countries. Zafar et al. [19] also found that the determinants of capital structure for developed countries are also valid for sixteen emerging countries.

However, the effect of determinants of capital structure differs among countries and industries. Sakr and Bedeir [20] studied the determinants of capital structure for non-financial firms listed in Egypt and found that profitability, size, tangibility, liquidity, growth opportunities, business risk, and financial flexibility are statistically significant for total debt, long-term debt, and short-term debt. Shaik et al. [21] analyzed non-financial firms in India and reported that only profitability, firm size, and growth opportunities have a significant impact on capital structure, while asset tangibility, non-debt tax shield, liquidity, and business risk are not significant.

On the other hand, Sutomo et al. [22] specifically focused on the coal-mining industry in Indonesia and reported that only profitability and asset tangibility have a significant effect on leverage. Gunardi et al. [23] studied construction firms in Indonesia and found tangibility on leverage is not significant. Yang et al. [24] studied 60 Korean and 32 Greek shipping companies. Profitability is found to be the most influential factor for the Korean shipping industry, while asset tangibility is marked as the most influential for Greek shipping industries.

It is evident that the empirical studies on the determinants of capital structure yield inconsistent results. In fact, there is no consensus on the findings between industries and within countries. Nevertheless, underlying these studies, there are common firm-specific factors that drive the decisions of leverage. The firm-specific factors are profitability, assets tangibility, growth opportunities, liquidity, and non-debt tax shield. Therefore, to understand the leverage of the O&G industry in Malaysia, our study focuses on the aforementioned common firm-specific factors.

2.1. Hypotheses Development

2.1.1. Profitability

Empirical evidences have confirmed that profitability is one of the main determinants of capital structure. However, both the pecking order and trade-off theories have different predictions on the direction of the relationship. The pecking order theory predicts a negative relation between profitability and leverage. According to Nga and Long [25], firms avoid using debt because debt increases the debt burden. Hence, firms with a high profitability will reduce the debt levels. Titman and Wessels [26], Booth et al. [18], Frank and Goyal [27], and Rajan and Zingales [28] are among the studies that reported a negative impact in accordance with the pecking order theory. On the other hand, from the perspective of trade-off theory, highly profitable firms have a positive relation with leverage. These firms with a high profitability will issue more debt to gain a tax shield [29]. In line with previous studies, profitability is measured as earnings before interest and taxes to total assets [18,30].

H1: *Profitability significantly impacts leverage.*

2.1.2. Asset Tangibility

Asset tangibility is defined as the ratio of tangible assets (property, plant, and equipment) to total assets [31,32]. It is a physical item with a monetary worth that can be used as collateral. It acts as a protection for creditors in case of financial distress [28]. In addition, the presence of tangible assets is projected to result in lower financial distress costs [33], as tangible assets certainly have more market value than intangible assets. Therefore, according to the trade-off theory, there is a positive relation between asset tangibility and leverage. This suggests that firms with higher levels of asset tangibility are more likely to issue greater amounts of debt. The studies that found positive relations are Zaheer et al. [34], Yang et al. [24], Rajan and Zingales [28], and Titman and Wessels [26]. On the contrary, the pecking order theory predicts tangible assets have an inverse impact on leverage because it carries less information asymmetry. Therefore, the cost of issuing equity is lesser [27]. Negative relations are found in Soekarno et al. [35] and Haron et al. [36].

H2: *Asset tangibility significantly impacts leverage.*

2.1.3. Growth Opportunities

Firms experiencing rapid growth in their total assets often require a huge amount of capital to assist firm growth, while every investment made by the firm requires capital, which the firm lacks. As a result, firms with opportunities for growth should consider utilizing debt as a means of supporting their expansion [27]. This supports the idea proposed by the pecking order theory, which suggests that there is a positive relationship with leverage. Hence, firms with growth opportunities should issue debt. Furthermore, businesses would miss out on opportunities to grow if debts were not available. Inversely, the trade-off theory has different arguments with regard to growth opportunities. According to Jaworski and Czerwonka [37], fast-growing firms tend to take on more projects regardless of the riskiness of the project. Hence, they contended that this action would increase the cost of debt. Additionally, there is an increased risk of bankruptcy for high-growth firms. Thus, trade-off theory predicts growth opportunities negatively impact leverage. Shaik et al. [21] found negative relations. Growth opportunities can be defined by the ratio of percentage change in total assets [26,38].

H3: Growth opportunities significantly impacts leverage.

2.1.4. Liquidity

The pecking order theory predicts liquidity negatively impacts capital structure. This is because firms with high liquidity can directly liquidate their assets to meet their urgent needs [39], hence suggesting firms with high liquidity should use less debt. The negative impact is robust with Soekarno et al. [35], Nga and Long [25], and Haron et al. [36]. On the flip side, the trade-off theory makes contradictory predictions. While the pecking order theory suggests that liquidity has a negative impact on leverage, the trade-off theory offers a different perspective. Ramli et al. [40] argued that the calculation of the current ratio involves dividing the total value of a firm's current assets by its current liabilities, and firms with a high current ratio have a better performance. Therefore, firms with a strong financial position and ample liquid assets have the capacity to take on more debt since they are able to fulfill their repayment responsibilities. Liquidity is measured as the ratio of current assets to current liabilities [21,36].

H4: *Liquidity significantly impacts leverage.*

2.1.5. Non-Debt Tax Shield (NDTS)

Under the trade-off theory hypothesis, debt interest is tax-deductible [41]. Therefore, debt is a preferable source of financing. However, DeAngelo and Masulis [42] showed an alternative method to reduce tax burden. They argued that a non-debt tax shield (non-debt-related corporate tax shield) is also capable of reducing the tax burden. In fact, sometimes the value of a non-debt tax shield is substantially large enough to outweigh the advantage of a debt-tax shield for a firm [42]. Since then, non-debt tax shields have been regarded as a significant factor for the capital structure to substitute the benefit of tax shields. Among the studies that found negative relations are Zaheer et al. [34] and Bajaj et al. [43]. Nevertheless, Soekarno et al. [35] and Saif-Alyousfi Abdulazeez et al. [32] found an NDTS positively impacts leverage. According to Soekarno et al. [35], the positive impact caused by the non-debt-related corporate tax shield is not sufficient to substitute the benefits of tax deductibility. An NDTS can be defined as the ratio of annual depreciation expenses to total assets [26,44].

H5: *Non-debt tax shield significantly impacts leverage.*

2.1.6. Moderating factor: Earnings Volatility

Earnings volatility is associated with the risk. This is due to the fact that increased earnings volatility increases the likelihood of financial distress since the firm may not be able to pay off its debt. Therefore, based on the trade-off theory, earnings volatility negatively impacts leverage. However, empirical studies have shown earnings volatility has contradictory results in which a high earnings volatility has a high level of leverage [32,45,46]. Saif-Alyousfi Abdulazeez et al. [32] argued that firms are not taking cautious measurements when issuing debt to safeguard themselves against financial difficulties and the possibility of going bankrupt. As a result, these firms are unable to repay debt and interest at maturity. It shows that firms lack prudent leverage decision strategies and risk-mitigation strategies which can lead to financial vulnerabilities. This suggests earnings volatility introduces a risk to firms. On the contrary, the positive impact of earnings volatility is in accordance with the pecking order theory. Frank and Goyal [47] argued that there is more information asymmetry in a firm with high volatile earnings, hence suggesting the use of debt instead of equity due to the higher cost of equity. As a result, the pecking order theory claimed a positive relation between earnings volatility and leverage. Nevertheless, to our knowledge, there has been no empirical research conducted that examines the moderating effect of earnings volatility on the relationship between firm-specific factors and leverage. Hence, the moderating effect of earnings volatility on the relationship between firm-specific factors and leverage is still unknown and we found this gap. Therefore, this study is particularly interested to know whether earnings volatility can influence the relationship between

firm-specific factors and leverage. Earnings volatility can be measured using the standard deviation of earnings before interest and taxes to total assets [18,30].

H6: *Earnings volatility moderates the relationship between firm-specific factors and leverage.*

2.1.7. Control Variables

Additionally, firm size and age are included in this study as control variables. Firm size is measured by the natural logarithm of total assets [36,48]. According to Saif-Alyousfi Abdulazeez et al. [32] and Bolarinwa and Adegboye [49], it is used to cognize the firm's ability to use collateral to secure debt. On the other hand, Saif-Alyousfi Abdulazeez et al. [32] argued that firm age as a control variable is used to account for the reputation of the firm. It can be measured using a natural logarithm of the number of years since incorporation [31,50,51].

3. Methodologies

3.1. Sample Data

The data used for this study consist of O&G industry firms listed in the main market of Bursa Malaysia from 2010 to 2019, covering a period of ten years. As of 2019, there are a total of 30 O&G firms. The financial data utilized in this study were obtained from the Thomson Reuters DataStream database, which provides access to a wide range of financial information and market research. However, the missing values were substituted by calculating the mean value from three subsequent years' data. All variables are winsorized at the 5th and 95th percentiles (except for asset tangibility) to overcome the effect of outliers.

3.2. Model

This section entails developing the model used to look at how Malaysia's O&G industry's capital structure is affected by firm-specific factors. As this study is comprised of both time-series and cross-sectional data (panel data); therefore, three techniques will be used: (1) pooled ordinary least square (POLS), fixed effects model (FEM), and random effects model (REM). However, the results will be based on the specific diagnostic tests: F-test, Breusch–Pagan LM test, and Hausman test. The capital structure, which is represented by leverage and measured by the ratio of total debt to total assets, serves as the dependent variable, while the independent variables are profitability, asset tangibility, growth opportunities, liquidity, and the non-debt tax shield. Furthermore, the study incorporates firm size and age as control variables. The earnings volatility is the moderating variable. To begin, capital structure is regressed against the seven explanatory variables (five independent variables and two control variables). Then, the next regression model includes the moderating variable (earnings volatility). Table 1 below shows the measurement of variables. The model is as below:

$$TD_{it} = \alpha + \beta_1 PROF_{it} + \beta_2 TANG_{it} + \beta_3 GROWTH_{it} + \beta_4 LIQ_{it} + \beta_5 NDTS_{it} + \beta_6 SIZE_{it} + \beta_7 AGE_{it} \varepsilon_{it} \quad (1)$$

where TD*it* is the total debt financing for the firm *i* in the year *t*. α is the intercept of the regression line and β stands for the coefficients. εit denotes the error term. Then, this study incorporates VOL to investigate the moderating influence of earnings volatility on the relationship between firm-specific factors and capital structure. The model is as below:

$$\begin{aligned} TD_{it} = {} & \alpha + \beta_1 PROF_{it} + \beta_2 TANG_{it} + \beta_3 GROWTH_{it} + \beta_4 LIQ_{it} + \beta_5 NDTS_{it} \\ & + \beta_6 VOL_{it} + \beta_7 SIZE_{it} + + \beta_8 AGE_{it} + \beta_9 (PROF * VOL)_{it} + \beta_{10} (TANG * VOL)_{it} \\ & + \beta_{11} (GROWTH * VOL)_{it} + \beta_{12} (LIQ * VOL)_{it} + \beta_{13} (NDTS * VOL)_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

Table 1. Measurement of variables.

Factors		Measurement	
Dependent variables			
Total debt	(TD)	Total debt to total assets	Delcoure [52], Ali et al. [45]
Independent variables			
Profitability	(PROF)	Earnings before interest and taxes to total assets	Booth et al. [18], De Jong et al. [30]
Asset tangibility	(TANG)	Tangible assets (property, plant, and equipment) to total assets	Chakrabarti and Chakrabarti [31], Saif-Alyousfi Abdulazeez et al. [32]
Growth opportunities	(GROWTH)	Growth in total assets ((total $asset_{i,t}$ - total $assets_{i,t-1}$)/Total $assets_{i,t-1}$)	Titman and Wessels [26], Moradi and Paulet [38]
Liquidity	(LIQ)	Total current assets to total current liabilities	Haron et al. [36], Shaik et al. [21]
NDTS	(NDTS)	Annual depreciation expenses to total assets	Titman and Wessels [26], Deesomsak et al. [44]
Moderating variable			
Earnings volatility	(VOL)	Standard deviation of earnings before interest and taxes to total assets	Booth et al. [18], De Jong et al. [30]
Control variable			
Size	(SIZE)	Natural logarithm of total assets	Haron et al. [36], Ahmed and Sabah [48]
Age	(AGE)	Natural logarithm of the number of years since incorporation	Chakrabarti and Chakrabarti [31], Nejad and Wasiuzzaman [51], Akhtar and Oliver [50]

3.3. Measurement

All the financial ratios used in this study are calculated at book value. Capital structure is proxied by leverage. Following previous studies [52], the measurement of leverage in this paper is calculated by dividing the total debt by total assets. Total debt includes both long-term and short-term debts. The utilization of the total debt divided by the total assets is to allocate the total assets of the O&G industry which are funded by debt. Table 1 presents the measurement of all variables used in this study.

4. Results and Discussions

4.1. Descriptive Statistics

Table 2 depicts the descriptive statistics. On average, the O&G industry used 29.74% of debt financing in its capital structure, much higher than reported by Saif-Alyousfi Abdulazeez et al. [32] while using non-financial firms in Malaysia. This demonstrates that, in comparison to studies with combined industries in Malaysia, Malaysia's O&G industry has a high level of debt. The mean for profitability is about 0.0210, indicating that 2.10% of earnings before interest and taxes is generated from total assets, while about 38.90% of the total assets of the O&G industry in Malaysia are made up of property, plant, and equipment. The average growth for the O&G industry in Malaysia is about 11.17%.

Table 2. Summary statistics for all explanatory variables.

Determinants	Obs	Mean	SD	Min	Max
Total debt	274	0.2974	0.1868	0.0042	0.6692
Profitability	274	0.0210	0.0938	−0.2216	0.1646
Asset tangibility	274	0.3890	0.2363	0.0004	0.9531
Growth opportunities	274	0.1117	0.3054	−0.3268	0.9043
Liquidity	274	1.5483	0.8993	0.2602	3.8483
Non-debt tax shield	274	0.0296	0.0168	0.0010	0.0647
Earnings volatility	274	0.0667	0.0682	0.0072	0.2569
Firm size	274	14.0832	1.1040	12.0506	16.3128
Firm age	274	2.5684	0.6633	1.3863	3.9890

4.2. Multicollinearity

The correlation coefficient between all variables under study is presented in Table 3. For the rule of thumb, there may be a multicollinearity concern if the absolute value is more than 0.9 [53]. However, the values shown in Table 3 are less than 0.9. Therefore, there is no multicollinearity issue. To affirm, the variance inflation factor (VIF) was also conducted where the cutoff point of the mean VIF should be less than 10 [54]. Table 4 shows the mean of VIF is 1.46. Hence, there is no multicollinearity issue.

Table 3. Pearson correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) TD	1.0000								
(2) PROF	−0.2736 **	1.0000							
(3) TANG	0.5503 **	−0.3069 **	1.0000						
(4) GROWHT	−0.0562	0.4403 **	−0.0861	1.0000					
(5) LIQ	−0.4972 **	0.2703 **	−0.4377 **	0.1267 *	1.0000				
(6) NDTS	0.2722 **	−0.2476 **	0.4184 **	−0.4041 **	−0.2460 **	1.0000			
(7) VOL	0.1263 *	−0.3699 **	0.0660	−0.1219 *	−0.0243	0.0718	1.0000		
(8) SIZE	0.3036 **	0.0533	0.2398 **	0.0934	−0.2237 **	0.1237 *	−0.2576 **	1.0000	
(9) AGE	−0.0525	−0.0012	−0.0660	−0.1629 **	−0.1233 *	0.0746	0.0175	0.3728 **	1.0000

Note: ** Correlation significant at 1%, * correlation significant at 5%.

Table 4. Variance inflation factor (VIF).

Determinants	VIF
PROF	1.61
TANG	1.62
GROWHT	1.56
LIQ	1.32
NDTS	1.47
VOL	1.28
SIZE	1.47
AGE	1.32
Mean VIF	1.46

4.3. Heteroscedasticity Test

The results of the heteroscedasticity test are presented in Table 5. Breusch–Pagan/Cook–Weisberg test was conducted to determine if there is evidence of heteroscedasticity. Based on the results, with a *p*-value greater than 0.05, it can be concluded that the variance of residuals is homogeneous.

Table 5. Breusch–Pagan/Cook–Weisberg test.

Source	Chi2	Prob > chi2
Heteroscedasticity	3.20	0.0737

4.4. Autocorrelation Test

Table 6 displays the results of the autocorrelation test. The Wooldridge test is performed to ensure there is no autocorrelation of the residuals in the model. The *p*-value less than 0.05 indicated there was an autocorrelation problem among the residuals. Therefore, the cluster-robust standard error is employed [55].

Table 6. Wooldridge test.

Source	F(1,29)	Prob > F
Autocorrelation	38.578	0.0000

4.5. Regression Analysis—Main Effect

As we know, this study is investigating the impact of firm-specific variables on capital structure for the O&G industry in Malaysia. Firstly, the partial F-test was used to choose between the pooled ordinary least square (POLS) and fixed effect model (FEM). The results of the F-test recommend FEM. Secondly, the Breusch–Pagan Lagrange multiplier (Breusch–Pagan LM) test was conducted to choose between POLS and the random effect models (REM)) suggests the use of REM. Finally, the Hausman specification test was conducted on the FEM model against the REM. Based on this test, it was found that the REM is more robust to explain the results. However, to address the issue of autocorrelation, we used REM with cluster-robust standard errors for estimation. Therefore, our final analysis and discussion are based on this model. The results of POLS, FEM, REM, and REM with cluster-robust standard errors are presented in Table 7 for the robustness check.

Table 7. Regression results.

Determinants	POLS	FEM	REM	REM with Cluster-Robust Standard Error
Profitability	−0.2258 **	−0.2418 ***	−0.2382 ***	−0.2382 **
Asset tangibility	0.2467 ***	0.2790 ***	0.2666 ***	0.2666 ***
Growth opportunities	0.0175	−0.0336	−0.0275	−0.0275
Liquidity	−0.0611 ***	−0.0506 ***	−0.0519 ***	−0.0519 ***
Non-debt tax shield	0.4088	−0.3444	−0.1616	−0.1616
Firm size	0.0366 ***	0.0345 **	0.0367 ***	0.0367 *
Firm age	−0.0414 ***	−0.0425	−0.0437 *	−0.0437
Constant	−0.1223	−0.0899	−0.1175	−0.1175
No. of observation	274	274	274	274
Hausman test (prob > chi^2)		0.9781 (Accept null hypothesis, REM is consistent)		
R^2	0.4309	0.3599	0.3595	0.3595
Adj R^2	0.4159			

Note: *** significant at 0.01, ** significant at 0.05, * significant at 0.10.

Profitability: The results show that profitability negatively impacts total debt at a significant level of 5%. This finding confirms the pecking order theory, which suggests that profitable firms tend to reduce their total debt. This provides support for Hypothesis 1 (H1). The result suggests the existence of information asymmetry in the O&G industry in Malaysia. Hence, firms have strict financing orders where they will use internal sources (retained earnings) rather than external sources of funds (debt and equity) [14]. The outcomes are aligned with the conclusions of Saif-Alyousfi Abdulazeez et al. [32] in the Malaysian context. Indeed, they contended that Malaysian firms have to reevaluate their reinvestment plans to rely more on internal sources of funds rather than debt. Furthermore, this study affirms the findings of earlier studies such as [21,24,56].

Asset tangibility: The result shows that asset tangibility positively impacts total debt at a significant level of 1%, hence validating the trade-off theory. This indicates that the higher the asset tangibility, the higher the total debt (that the O&G industry should have), hence supporting Hypothesis 2 (H2). This finding highlights the collateral aspect as the main cause for the O&G industry in Malaysia in seeking their leverage. This result is consistent with previous empirical findings such as Yang et al. [24] and Ahmed and Sabah [48]. However, this result contradicts the finding of Uddin et al. [57] which supports pecking order theory here.

Growth opportunities: The results show growth opportunities do not have a significant impact on total debt for the O&G industry in Malaysia. Hence, we neither support the pecking order nor the trade-off theory here. Despite that, it should be noted that the time range of the investigation is unusual with a large fluctuation in oil prices. During this downturn, firms may reduce their investment activities leading to lower changes in total

assets; thus, it does not significantly impact the total debt. Therefore, Hypothesis 3 (H3) could not be proved.

Liquidity: The result presents that liquidity negatively impacts total debt for the O&G industry in Malaysia. Therefore, Hypothesis 4 (H4) holds true. This finding validates pecking order theory, which suggests that firms with high liquidity tend to have lower levels of leverage. This indicates that Malaysia's O&G industry is in a favorable position in terms of liquidity, enabling them to easily fulfill their short-term obligations. This result is aligned with Ali et al. [45], Baidoo [56], and Nga and Long [25].

Non-debt tax shield: The NDTS shows an insignificant impact on the total debt. This result is robust with Shaik et al. [21] and Haron et al. [36]. Therefore, Hypothesis 4 (H4) was not supported.

Firm Size: Firm size shows a positive and significant impact on total debt. The findings indicate that the large O&G industry in Malaysia utilizes greater debt to finance their investments. This finding supports the trade-off theory applications that larger firms are more stable and less likely to go bankrupt [27]; hence, leveraging debts can be advantageous in terms of tax shield which is corroborated with Saif-Alyousfi Abdulazeez et al. [32].

Firm Age: The result shows that firm age does not have a significant impact on total debt in the O&G industry in Malaysia. Most of the O&G firms in Malaysia are still young. It can be argued that these firms are still in the process of establishing their optimal capital structure.

4.6. Regression Analysis—Moderating Effect

As shown in Table 8, when earnings volatility is considered as the moderating variable, the relationship between assets tangibility and total debt (as represented by the interaction term asset tangibility earnings volatility) is found to be negative and significant. Although firms have physical assets that they can use as collateral to secure debt financing, high earnings volatility can diminish the effectiveness of these assets as a form of security for lenders. According to Domanski et al. [5], banks tend to require additional collateral during a slump in oil prices especially for firms with high levels of debt. Suggesting that tangible assets may be valued at less than their nominal worth.

Table 8. Regression result.

Determinants	POLS	FEM	REM	REM with Cluster-Robust Standard Error
Profitability	0.0140	−0.1431	−0.0909	−0.0909
Asset tangibility	0.3613 ***	0.4155 ***	0.3955 ***	0.3955 ***
Growth opportunities	0.0552	−0.0823 **	−0.0609	−0.0609
Liquidity	−0.0416 ***	−0.0342 **	−0.0348 ***	−0.0348 ***
Non-debt tax shield	−0.4441	−1.3434	−1.2294	−1.2294
Earnings volatility	1.1318 ***	0.9970 ***	0.9830 ***	0.9830
Firm size	0.0453 ***	0.0574 ***	0.0539 ***	0.0539 **
Firm age	−0.0497 ***	−0.0679 **	−0.0567 ***	−0.0567 *
Profitability *VOL	−0.8049	−0.0505	−0.3429	−0.3429
Asset tangibility * VOL	−1.3799 **	−1.3079 ***	−1.3314 ***	−1.3314 *
Growth * VOL	−0.5006	0.4761	0.3302	0.3302
Liquidity * VOL	−0.2288	−0.1868 *	−0.1928 *	−0.1928
Non-debt tax shield * VOL	9.4136	11.6948 *	11.8771 *	11.8771
Constant	−0.3149 **	−0.4320 **	−0.4098 **	−0.4098 **

Note: *** significant at 0.01, ** significant at 0.05, * significant at 0.10.

The moderating effects of earning volatility on the relationship between profitability and total debt (profitability * earnings volatility) and liquidity and total debt (liquidity * earnings volatility) show insignificant results. This shows a contrasting result when there is no moderating variable, i.e., the liquidity shows a negative relationship. This is because there is a risk of liquidity shortfall during the volatile earnings [5]. Nevertheless, the

moderating effect of earnings volatility on the relationship between growth opportunities (growth opportunities * earnings volatility) and the non-debt tax shield and total debt (non-debt tax shield * earnings volatility) remains insignificant. Therefore, the moderating factors of earnings volatility show partial support.

5. Conclusions

Firstly, this study investigates the impact of firm-specific factors on the capital structure of the O&G industry in Malaysia. Capital structure was proxied by leverage and measured as the total debt ratio. Based on the results shown in Table 7, profitability negatively impacts leverage which supports the hypothesis of pecking order theory. The asset tangibility positively impacts leverage, which is consistent with the collateral aspect of asset tangibility given in trade-off theory. Liquidity negatively impacts leverage, which is robust under pecking order theory. On the other hand, this study also includes firm size and age as control variables where the former shows a positive significant impact on leverage and, later, is not an important determinant of capital structure for the O&G industry in Malaysia.

Secondly, in order to examine the moderating impact on the relationship between firm-specific factors and capital structure, an earnings volatility variable was introduced to the regression model. Interestingly, referring to the results (for asset tangibility *VOL) given in Table 8, the interaction between asset tangibility and leverage has significantly switched to negative. Here, we argue that tangible assets may be valued at less than their nominal worth during high earnings volatility. Consequently, the O&G industry in Malaysia should consider the moderating impacts of earnings volatility to strategize their capital structure decisions effectively.

This study contributes to the existing literature on the impact of firm-specific variables on capital structure for the O&G industry in Malaysia. There seems to be some variation in the results for the O&G industry in Malaysia that may be related to the industry characteristics. It highlights that managers, as well as policymakers, should analyze the firm-specific factors in accordance with the O&G industry to formulate the capital structure policy to increase the firm value. In fact, managers and policymakers should place greater emphasis on earnings volatility since it changes the relationship between firm-specific factors and leverage to obtain an optimal capital structure.

Last but not the least, this study focuses on leverage, which is calculated as the ratio of the total debt divided by the total assets for the Malaysian O&G industry. Future endeavors may decompose the total debt ratio into long-term and short-term debt to gain a better understanding of the influence of capital structure factors.

Author Contributions: Conceptualization, M.M.; methodology, M.M. and H.H.H.; literature review, M.M. and H.H.H.; software, M.M. and H.H.H.; validation, H.H.H.; formal analysis, M.M. and H.H.H.; writing review and editing, R.B.; supervision, M.M.; data collection, H.H.H. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the Collaborative Research Fund (CRF), Funding No. 015ME0-364.

Institutional Review Board Statement: No applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data were collected from the Thomson Reuters DataStream database (accessed on 11 October 2021).

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Myers, S.C. Capital Structure. *J. Econ. Perspect.* **2021**, *15*, 81–102. [CrossRef]
2. Kumar, S.; Colombage, S.; Rao, P. Research on Capital Structure Determinants: A Review and Future Directions. *Int. J. Manag. Financ.* **2017**, *13*, 106–132. [CrossRef]
3. Lu, H.; Guo, L.; Azimi, M.; Huang, K. Oil and Gas 4.0 Era: A Systematic Review and Outlook. *Comput. Ind.* **2019**, *111*, 68–90. [CrossRef]

4. Narayan, P.K.; Nasiri, M.A. Understanding Corporate Debt from the Oil Market Perspective. *Energy Econ.* **2020**, *92*, 104946. [CrossRef] [PubMed]
5. Domanski, D.; Kearns, J.; Lombardi, M.J.; Shin, H.S. Oil and Debt. In *BIS Quarterly Review March*. 2015. Available online: https://ssrn.com/abstract=2580295 (accessed on 20 April 2023).
6. The World Bank. Data Country Classification. Available online: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups (accessed on 24 September 2023).
7. Tan, Y.-L.; Shafi, R.M. Capital Market and Economic Growth in Malaysia: The Role of Sukūk and Other Sub-Components. *ISRA Int. J. Islam. Financ.* **2021**, *13*, 102–117. [CrossRef]
8. International Islamic Financial Market. Sukuk Report. A Comprehensive Study of the Global Sukuk Market. 2020. Available online: http://www.iifm.net/public/sukuk-reports (accessed on 20 April 2023).
9. Foo, V.; Jamal, A.A.A.; Karim, M.R.A.; Ulum, Z.K.A.B. Capital Structure and Corporate Performance: Panel Evidence from Oil and Gas Companies in Malaysia. *Int. J. Bus. Manag. Econ. Res.* **2015**, *6*, 371–379.
10. Ismail, N.; Mazlan, N. Global Oil Price Crisis Effect on Malaysia Oil and Gas Firms. *Eur. Proc. Soc. Behav. Sci.* **2020**, *100*, 541–549. [CrossRef]
11. Han, S. *Oil Price Volatility, an Economic Determinant of Earnings Volatility-Empirical Analysis on Earnings Volatility of US Oil and Gas Companies between 1986–2016*; Working Paper; Aalto University School of Business: Espoo, Finland, 2017.
12. Modigliani, F.; Miller, M.H. The Cost of Capital, Corporation Finance and the Theory of Investment. *Am. Econ. Rev.* **1958**, *48*, 261–297.
13. Myers, S.C. The Capital Structure Puzzle. *J. Financ.* **1984**, *39*, 574–592. [CrossRef]
14. Myers, S.; Majluf, N. Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have. *J. Financ. Econ.* **1984**, *13*, 187–221. [CrossRef]
15. Jensen, M.C.; Meckling, W.H. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *J. Financ. Econ.* **1976**, *3*, 305–360. [CrossRef]
16. Baker, M.; Wurgler, J. Market Timing and Capital Structure. *J. Financ.* **2002**, *57*, 1–32. [CrossRef]
17. Kahya, E.H.; Ersen, H.Y.; Ekinci, C.; Taş, O.; Simsek, K.D. Determinants of Capital Structure for Firms in an Islamic Equity Index: Comparing Developed and Developing Countries. *J. Cap. Mark. Stud.* **2020**, *4*, 167–191. [CrossRef]
18. Booth, L.; Aivazian, V.; Demirguc-Kunt, A.; Maksimovic, V. Capital Structures in Developing Countries. *J. Financ.* **2001**, *56*, 87–130. [CrossRef]
19. Zafar, Q.; Wongsurawat, W.; Camino, D. The Determinants of Leverage Decisions: Evidence from Asian Emerging Markets. *Cogent Econ. Financ.* **2019**, *7*, 1598836. [CrossRef]
20. Sakr, A.; Bedeir, A. Firm Level Determinants of Capital Structure: Evidence from Egypt. *Int. J. Financ. Res.* **2019**, *10*, 68–85. [CrossRef]
21. Shaik, M.B.; Kethan, M.; Rani, I.; Mahesh, U.; Harsha, C.S.; Navya, M.K.; Sravani, D. Which Determinants Matter for Capital Structure? An Empirical Study on NBFC'S in India. *Int. J. Entrep.* **2022**, *26*, 1–9.
22. Sutomo, S.; Wahyudi, S.; Pangestuti, I.R.D.; Muharam, H. The Determinants of Capital Structure in Coal Mining Industry on the Indonesia Stock Exchange. *Invest. Manag. Financ. Innov.* **2020**, *17*, 165–174. [CrossRef]
23. Gunardi, A.; Firmansyah, E.; Widyaningsih, I.; Rossi, M. Capital Structure Determinants of Construction Firms: Does Firm Size Moderate the Results? *Montenegrin J. Econ.* **2020**, *16*, 93–100. [CrossRef]
24. Yang, H.; Lee, K.; Lim, S. A Comparative Study of the Determinants of Capital Structure in Shipping Companies: The Case of Korea and Greece. *Marit. Policy Manag.* **2021**, *49*, 528–539. [CrossRef]
25. Nga, N.T.V.; Long, G.N. The Choice of Capital Structure: A Study on Energy Industry in a Developing Country. *Accounting* **2021**, *7*, 289–294. [CrossRef]
26. Titman, S.; Wessels, R. The Determinants of Capital Structure Choice. *J. Financ.* **1988**, *43*, 1–19. [CrossRef]
27. Frank, M.Z.; Goyal, V.K. Capital Structure Decisions: Which Factors Are Reliably Important? *Financ. Manag.* **2009**, *38*, 1–37. [CrossRef]
28. Rajan, R.G.; Zingales, L. What do we know about capital structure? Some evidence from international data. *J. Financ.* **1995**, *50*, 1421–1460. [CrossRef]
29. Khémiri, W.; Noubbigh, H. Determinants of Capital Structure: Evidence from Sub-Saharan African Firms. *Q. Rev. Econ. Financ.* **2018**, *70*, 150–159. [CrossRef]
30. de Jong, A.; Kabir, R.; Nguyen, T.T. Capital Structure Around the World: The Roles of Firm- and Country-Specific Determinants. *J. Bank. Financ.* **2008**, *32*, 1954–1969. [CrossRef]
31. Chakrabarti, A.; Chakrabarti, A. The Capital Structure Puzzle—Evidence from Indian Energy Sector. *Int. J. Energy Sect. Manag.* **2019**, *13*, 2–23. [CrossRef]
32. Saif-Alyousfi, A.Y.; Md-Rus, R.; Taufil-Mohd, K.N.; Taib, H.M.; Shahar, H.K. Determinants of Capital Structure: Evidence from Malaysian Firms. *Asia-Pac. J. Bus. Adm.* **2020**, *12*, 283–326. [CrossRef]
33. Chipeta, C.; Deressa, C. Firm and Country Specific Determinants of Capital Structure in Sub Saharan Africa. *Int. J. Emerg. Mark.* **2016**, *11*, 649–673. [CrossRef]
34. Zaheer, D.R.; Ahmed, S.A.; Ali, S.R.; Aleem, A. Determinants of Capital Structure-Evidence from Oil and Gas Tradable Sector Index (Ogti) of Pakistan Stock Exchange. *J. Contemp. Issues Bus. Gov.* **2021**, *27*, 129–142.

35. Soekarno, S.; Prayoga, E.M.; Mambea, I.Y. Determinants of Capital Structure's Adjustment Speed: Empirical Analysis of Real Estate, Property, and Construction Firms. *J. Bisnis Dan Manaj.* **2021**, *22*, 51–64. [CrossRef]
36. Haron, R.; Nomran, N.M.; Othman, A.H.A.; Husin, M.M.; Sharofiddin, A. The Influence of Firm, Industry and Concentrated Ownership on Dynamic Capital Structure Decision in Emerging Market. *J. Asia Bus. Stud.* **2021**, *15*, 689–709. [CrossRef]
37. Jaworski, J.; Czerwonka, L. Meta-study on Relationship between Macroeconomic and Institutional Environment and Internal Determinants of Enterprises' Capital Structure. *Econ. Res.-Ekon. Istraživanja* **2019**, *32*, 2614–2637. [CrossRef]
38. Moradi, A.; Paulet, E. The Firm-Specific Determinants of Capital Structure—An Empirical Analysis of Firms before and DURING the Euro Crisis. *Res. Int. Bus. Financ.* **2019**, *47*, 150–161. [CrossRef]
39. Vo, X.V. Determinants of Capital Structure in Emerging Markets: Evidence from Vietnam. *Res. Int. Bus. Financ.* **2017**, *40*, 105–113. [CrossRef]
40. Ramli, N.A.; Latan, H.; Solovida, G.T. Determinants of Capital Structure and Firm Financial Performance—A PLS-SEM Approach: Evidence from Malaysia and Indonesia. *Q. Rev. Econ. Financ.* **2019**, *71*, 148–160. [CrossRef]
41. Modigliani, F.; Miller, M.H. Corporate Income Taxes and the Cost of Capital: A Correction. *Am. Econ. Rev.* **1963**, *53*, 433–443.
42. DeAngelo, H.; Masulis, R.W. Optimal Capital Structure under Corporate and Personal Taxation. *J. Financ. Econ.* **1980**, *8*, 3–29. [CrossRef]
43. Bajaj, Y.; Kashiramka, S.; Singh, S. Capital Structure Dynamics: China and India (Chindia) Perspective. *Eur. Bus. Rev.* **2020**, *32*, 845–868. [CrossRef]
44. Deesomsak, R.; Paudyal, K.; Pescetto, G. The Determinants of Capital Structure: Evidence from the Asia Pacific Region. *J. Multinatl. Financ. Manag.* **2004**, *14*, 387–405. [CrossRef]
45. Ali, S.; Rangone, A.; Farooq, M. Corporate Taxation and Firm-Specific Determinants of Capital Structure: Evidence from the UK and US Multinational Firms. *J. Risk Financ. Manag.* **2022**, *15*, 55. [CrossRef]
46. Dakua, S. Effect of Determinants on Financial Leverage in Indian Steel Industry: A Study on Capital Structure. *Int. J. Financ. Econ.* **2019**, *24*, 427–436. [CrossRef]
47. Frank, M.Z.; Goyal, V.K. *Capital Structure Decisions*; Working Paper; University of British Columbia: Vancouver, BC, Canada, 2003.
48. Ahmed, I.E.; Sabah, A. The Determinants of Capital Structure of the GCC Oil and Gas Companies. *Int. J. Energy Econ. Policy* **2021**, *11*, 30. [CrossRef]
49. Bolarinwa, S.T.; Adegboye, A.A. Re-Examining the Determinants of Capital Structure in Nigeria. *J. Econ. Adm. Sci.* **2021**, *37*, 26–60. [CrossRef]
50. Akhtar, S.; Oliver, B. Determinants of Capital Structure for Japanese Multinational and Domestic Corporations. *Int. Rev. Financ.* **2009**, *9*, 1–26. [CrossRef]
51. Nejad, N.R.; Wasiuzzaman, S. The Empirical Analysis of Capital Structure Determinants—Evidence from Malaysia. *Eng. Technol.* **2013**, *74*, 466–474.
52. Delcoure, N. The Determinants of Capital Structure in Transitional Economies. *Int. Rev. Econ. Financ.* **2007**, *16*, 400–415. [CrossRef]
53. Tabachnick, B.G.; Fidell, L.S.; Ullman, J.B. *Using Multivariate Statistics*; Pearson: Boston, MA, USA, 2013.
54. Gujarati, D.N.; Porter, D.C. *Basic Econometrics*, 5th ed.; The Mc-Graw Hill: New York, NY, USA, 2008.
55. Yildirim, R.; Masih, M.; Bacha, O.I. Determinants of Capital Structure: Evidence from Shari'ah Compliant and Non-Compliant Firms. *Pac.-Basin Financ. J.* **2018**, *51*, 198–219. [CrossRef]
56. Baidoo, D.A. Factors Influencing Capital Structure: An Empirical Evaluation of Major Oil and Gas Producing Companies Operating in Ghana. *Int. J. Financ. Res.* **2022**, *3*, 294–311. [CrossRef]
57. Uddin, M.N.; Khan, M.S.U.; Hosen, M. Do Determinants Influence the Capital Structure Decision in Bangladesh? A Panel Data Analysis. *Int. J. Bus. Soc.* **2022**, *23*, 1229–1248. [CrossRef]