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The Financing Decision of Oil and Gas Companies: The Role of Country Level Shareholder Protection

Halit Gonenc, Oleksandr Lebediev, and Wim Westerman

1 Introduction

> The petroleum industry is (. . .) highly capital-intensive, so strong returns are critical to attracting low-cost debt and equity capital. In fact, while many of the integrated companies have the cash flow and financial wherewithal to fund capital spending internally, they frequently rely on external debt and new equity capital, particularly to finance larger acquisitions and mergers.—Rating Methodology: Global Integrated Oil & Gas Industry, Moody's Investor Services, October 2005, p. 12.

The current situation in the energy industry can be described as "severe competition." Up until about 20 years ago, oil and gas companies had a strict capital discipline (Mohn and Misund 2009), but developing financial markets require investments to improve key performance indicators (Osmundsen et al. 2006). Thus, a better outcome orientation leads oil and gas companies to search for new reserves, and then in turn drastically increases the need for sufficient capital. Oil and gas firms can be characterized as having a similar capital structure with heavy use of debt financing, and not hesitating to acquire additional debt to finance vital business opportunities (Inkpen and Moffett 2011).

Previous research has mainly focused on the effect of capital structure on the performance of oil and gas companies (Haushalter 2000; Ewing and Thompson 2016) and the comparison of those companies with other industries (Talberg et al. 2008). To test capital structure hypotheses, the debt-to-equity ratio is used to define the capital mix as an indicator of the asset financing (Ewing and Thompson 2016). The capital structure of the oil and gas companies is of great importance, because they operate in a capital intense industry. Oil and gas companies have a relatively large amount of fixed assets, which they need to run daily activities and can also be used as collateral for debt (Talberg et al. 2008). There has been less attention to the

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determinants of financing sources used to fund the investments of oil and gas companies (Haushalter 2000; Ewing and Thompson 2016). Therefore, we aim to add new findings to the existing literature in order to outline ways for oil and gas companies to finance their investments. We test three major capital structure theories: the dynamic trade-off theory, the pecking order theory, and the market timing theory. The *dynamic trade-off theory* assumes a continuous change in the firm's debt and equity. It implies that the firm tends to adjust its leverage ratio to the targeted one with low transaction costs (Elsas et al. 2014). Under the *pecking order theory*, there exists asymmetric information about the values of investments and financial slack between the firm and investors in the market. Therefore, investors require additional premium in case the firm tries to raise external funds. In order to avoid these uncertainties, firms tend to use internal financing, but when those funds are not enough, they should issue debt first and equity as a last resort (Myers 2001; Frank and Goyal 2007). The third capital structure theory is the *market timing theory*. Under this theory, the firm tries to issue securities priced at maximum attainable value due to favorable market conditions (Korajczyk et al. 1991; Baker and Wurgler 2002; Elsas et al. 2014).

This chapter studies the following research questions: How do oil and gas companies finance their investments? What are the determinants of alternative financing choices? Our aim is to identify the theoretical reasoning behind such choices. Companies in oil and gas industries demonstrate a need for a capital (debt/equity), because they are always in situations of complexity, uncertainties, and risks and tend to use any possible source of capital available. One of the main complexities is the changing price for oil and gasoline. The popularity of oil and gas companies' shares is based on the price of crude oil and gasoline. For example, at the condition of rising prices during the period between 2003 and 2008, the market was eager for the new offerings of publicly traded shares from oil and gas companies. However, when the prices dropped, the popularity dropped as well (Inkpen and Moffett 2011). Since Seth (2015) indicates a relationship between gas and oil prices, price volatility in the oil industry would also have an influence on the gas companies. Therefore, changes in oil prices would be important for the capital formation by those firms. Mohn and Misund (2009) describe that the increase in the price volatility has a significant effect on the capital formation in the oil and gas industry. Therefore, we control for the changes in the oil price and oil price volatility influencing the capital formation.

To be able to test dynamic models, we select a long time period, from 2001 until 2015. We require oil and gas companies to have financial data at least 5 years prior to 2001,[1] which resulted in data collection from 18 countries. We employ a level of shareholder protection index developed by La Porta et al. (2008) and Djankov et al. (2008), and further studied and explained by McLean et al. (2012). The index is directly related to the capital structure of the firms. Higher shareholder protection

[1]This restriction controls the effects of possible capital structure differences of the IPO (Initial Public Offering) firms on our analysis in few years after they went to the public.

improves corporate access to external finance, which is highly relevant in the capital dependent oil and gas industry (La Porta et al. 1997, 1998). Additionally, in countries with strong shareholder protection, corporate officials are less likely to use internal resources and are therefore eager (compared to weak shareholder protection countries) to go for external financing as the way to benefit shareholders (Wurgler 2000; Shleifer and Wolfenzon 2002; Bekaert et al. 2011).

A short summary of our major findings is as follows. Using multivariate regression analysis, we discover that oil and gas companies rely heavily on debt issues. Companies issue debt to make adjustments toward the targeted leverage ratio. They prefer to issue as much debt as possible and payout when the opportunity arises in order to get more debt financing, consistent with the dynamic trade-off theory. Oil and gas firms with high profits tend to use their income for the financing of their investments, which is in line with the pecking order theory. Surprisingly, they tend to use high profits as a substitution for equity. This contradicts the general idea of the pecking order theory hypothesis to use debt in case of low cash flows. The market timing theory receives partial support, especially with taking the effect of shareholder protection into account. We discover that past period stock returns influence the equity issuance in countries with high level of shareholder protection.

This chapter is structured as follows. The next section is meant for the literature review and the hypothesis development. In Sect. 8.3, we provide a detailed description of the data sample and the methodology. After this, we continue with the results part and we finish with conclusions and limitations.

2 Literature Review and Hypothesis Development

2.1 Internal and External Investment Financing

Myers (2001) describes that gross investments in US nonfinancial companies are largely made internally, covering somewhere around 80% of the total investment at the time. Equally important is that financing deeply varies among industries. For example, in the energy industry, large integrated oil companies rely more on external financing through debt than on internal financing. Thus, it is important to look at if internal financing or external financing is more preferable.

Bond and Meghir (1994) try to resolve the issue about the relation of corporate investments and the availability of internal funds. They employ a hierarchy of finance model and assume that internal financing is available at lower costs than external financing. Additionally, they argue that tax treatment differences make companies to use more of their internal funds because of lost tax shields. Financial decisions of firms should be in line with their investments, because they usually do not have unlimited access to the financing and thus they need to address the potential costs created by external financing. The hierarchy of finance model shows that corporate intentions to invest depend on the availability of internal funds. The authors demonstrate that other ways of investment are basically irrelevant, since new equity issued allows shedding out dividends and does not affect present value. They state that using debt is irrelevant as well, even in the presence of bankruptcy risk (at no deadweight costs of bankruptcy). Firms may find some sources for investment more preferable than others, and the preferable source of investment is internal funds, in case of tax advantages of capital gains over dividend income or significant transactions fees when issuing new shares. Thus, the availability of low-cost funds generated internally might be a huge boost for investments (Myers 1984).

Contrary to Bond and Meghir (1994), Love (2003) indicates the importance of external finance to affect the firm's financial developments and its investment decisions. The importance of the financial sector in pushing the development of markets and firms was already recognized long ago. Modigliani and Miller (1958) showed that on the micro-level with perfect capital markets, finance is not relevant for financial decisions. However, markets are not perfect due to inequality of information between parties, which results in different costs between external and internal financing. From firm-level data, Love (2003) managed to show that financial constraints decrease with financial development, which results in more available external financing. Firms facing those constraints behave as if they have a large cost of capital and thus postpone their investment until a better market situation. Additionally, Demirgüç-Kunt and Maksimovic (1998) found a positive relation between the growth of the firms that are using both internal and external financing and the financial development and legal systems in those countries. Also, Rajan and Zingales (1998) showed that industries with more need for external financing grow faster in the more developed markets. Factors such as legal system, uncertainty, and level of corruption were used by Love (2003), in order to show the influence of country level factors on the supply of external financing for firms. This development adds new relatively less costly ways of raising capital for the investment purposes. This is important for our research, and thus we continue with additional factors that have an influence on corporate investment decisions.

2.2 *Influence of Uncertainty on Investments*

In the perfect scenario—where everyone has perfect information and no uncertainty, firms can easily decide on how much to invest. Yet, in real-world situations, it is often difficult to determine the exact level of investments that firms want to undergo, which is usually followed by over/under investments (Pindyck and Rubinfeld 1991; Dixit and Pindyck 1994). In our imperfect world, the influence of uncertainty level on investments has always been the main priority for scholars, but still there is no common agreement on the relation between investment and uncertainty. Standard models of investments suggest that this relationship is negative (Dixit and Pindyck 1994). However, according to among others Smit and Trigeorgis (2004), this relationship could be positive, in case a company (especially in gas and oil sectors) stops awaiting future benefits options of its investment when it expects high levels of price volatilities (Kulatilaka and Perotti 1998; Sarkar 2000). Simultaneously, according to Grenadier (2002) and Akdoğu and MacKay (2008), the value of the waiting option would be affected by factors such as imperfect competition and strategic investment. Scholars deliver two types of price uncertainty: temporal and permanent. For the temporary periods of uncertainty, oil and gas companies could consider oil price volatilities as a transition phenomenon Mohn and Misund (2009). This transit phenomenon with high peaks of oil price volatility is considered to be followed by a period of decreasing volatility. This by any means follows the standard investment irreversibility theory. According to this theory, the relationship between investment and uncertainty (oil price volatility in our case) is negative, as was concluded by Favero et al. (1992) and Osmundsen et al. (2006). However, the approach on strategic investments and compound options highlights a positive relation between uncertainty and investments. Scholars did present findings for sample periods of 20 years ago Mohn and Misund (2009), but the current situation could have changed the relation between uncertainty and investments.

Mohn and Misund (2009) delivered their result from a strategic investment approach view, but did not specify the concrete link between this approach and oil pricing. They were referring to Smit and Trigeorgis (2004) that the strategic investment approach dominates the oil and gas companies' investment incentives. During period of uncertainty, firms can wait for new information, thus declining any possible returns from early investments (strategic or not). Henriques and Sadorsky (2011) showed that increases in uncertainty raise the option value of waiting such that investments are postponed. However, things are changing with strategic investments that cannot be postponed forever for the sake of better information. Dedicating attention to this topic is needed, since oil prices significantly affect investment incentives of oil and gas companies. Henriques and Sadorsky (2011) state that the correlation between oil and gas prices ranges from 26% in general up to 70%. In addition, the 2008–2009 global crisis and subsequent oil price drops may shed new insights into the relation between uncertainty levels and investments. After having discussed capital structure and uncertainty factors, we now look more deeply into these and develop our hypotheses.

2.3 Capital Structure Theories and Hypotheses

From one side of the capital structure debate, it is considered that capital structure is stable over a long period of time, that majority of variation in the capital structure is time-invariant, and that much of that variation cannot be accounted for with existing models. Lemmon et al. (2008) showed that the initial leverage ratio of the firm has a significant impact on the future ratio. The second important discovery was that the leverage category contains in itself an unobserved firm-specific component. This component could differ in technologies, market power, managerial behavior, investment, and other company-specific factors (Hoch 1962; Kuh 1963). Additionally, firms with high leverage tend to use equity to reduce their leverage (Lemmon et al.

2008). However, it would be reasonable to discover whether that tendency is related to energy companies.

At another side of the debate, there is the classic work of Modigliani and Miller (1958), stating that capital structure does not influence the firm value, where there is not a single disruptor in the market or in other words: when the market is perfect. Obviously, it is not and disruptions can affect capital structure of the firms. That is why there is still another side of the debate—studies about market imperfections and its effect on the capital structure of the firm. The general idea is here that because of market imperfection, capital structure is related to firms' efficiency and financing (Myers 2001; Flannery and Rangan 2006), thus a focus on the capital structure makes much sense. Whereas the *dynamic trade-off theory* emphasizes on taxes and agency problems, the *pecking order theory* and the *market timing theory* emphasize on differences in information. The pecking order theory implies that companies' shares are generally overpriced. In order to finance projects, firms generate funds internally, then, if the internal funds are insufficient they are going for the safe debt, and the last resort alternative is equity issuance. The market timing theory differs from the pecking order theory in that managers possess internal information about firms and should use their abilities to sell overpriced equity shares (Baker and Wurgler 2002). Flannery and Rangan (2006) argue that the market timing theory allows managers to routinely use information asymmetries to benefit the shareholders. It is important to note that the other two theories are not based on target debt ratios as the dynamic trade-off theory holds. Flannery and Rangan (2006) find various supports for all of the three theories mentioned above, although targeting behavior dominates over pecking order and market timing behavior together.

Elsas et al. (2014) study the topic of the financing problem for large investments. They look mainly to the Statement of Cash Flows (SCF) in order to examine the ratio between external and internal funds used for investment financing. They stated that roughly 67 to 83% of corporate large investments were made internally, while only 31% of small investments were financed externally. Elsas et al. (2014) were not interested in leverage ratio changes. They indicate that the more profitable firms tend to rely more on internal financing, with internal funds replacing potential equity issuance and not debt, which is line with pecking order theory. In this case, leverage remains unchanged, and profitability does not affect leverage when the firms undergo large investments. Researchers focused mainly on firms from mining, information, manufacturing, accommodation, and food services industries. They did not focus on energy firms, because their investments would not satisfy criteria for "large investments" that should be at least 30% of book assets and 200% of corporate trading investment expenditures. However, the value of regular investments by big energy companies might have been even larger than large investments by those companies. This warrants a study on the financing of investments of energy industry companies. In order to test capital structure hypotheses, we must clarify them first. We take on the line of reasoning by Elsas et al. (2014).

Dynamic Trade-off Hypothesis According to the *dynamic trade-off hypothesis*, each company searches for an optimal capital ratio that reflects its specific characteristics. Under this hypothesis, firm should move toward the required target with the issuance of debt or equity. Therefore, we can show the following relation between optimal capital ratio and debt:

Hypothesis 1: A positive deviation from the target leverage of the firms has a positive impact on the amount of the firms' debt.

Pecking Order Hypothesis When a firm is trying to sell its stock to the public, costs are imposed on shareholders. In order to avoid those costs, firms prefer to finance their activities internally. In case internal funds are not sufficient, firms prefer to issue debt over equity. Therefore, we show as relation between profits and levels of debt/equity/cash flows:

- *Hypothesis 2a: Profits of the firms have a positive impact on their cash flows.*
- *Hypothesis 2b: Profits have a negative impact on the level of debt (equity issuance).*

Market Timing Hypothesis Firms are trying to issue stocks in favorable prices when they go to the market in order to spot this "timing." Firms refer to the value of (Tobin's) Q as a measure of the relation between the market value and the book value of the equity. Stock return is also proxy of higher valuation on the market to affect financing decisions. Therefore, we show the relationships between Q and equity issuance and between stock returns and equity issuance separately:

Hypothesis 3: Q and stock returns have a positive impact on the equity issuance.

2.4 Shareholder Protection Level

Elsas et al. (2014) did not account for heterogeneity between different countries. In order to do so we address attention to country level factors. Scholars have argued that the investor protection level has a significant effect on the firms' capital structure and therefore on how they finance their investments (La Porta et al. 1997, 2002, 2006, 2008). More recently, McLean et al. (2012) assume that investor protection improves corporate access to external finance for investment projects, which is consistent with La Porta et al. (1997, 2002). Additionally, they link this relationship to Q and discover that when a country has strong investor protection laws, the correlation between Q and external finance is positive. However, they also find that in countries with strong investor protection investment is less sensitive to cash flows and external finance is negatively related to it. Firms with a limited (low) amount of cash flows would require an additional source of financing in the terms of external financing. Following Fazzari et al. (1988) and Hubbard (1997), this was checked for when governments lessened external finance costs. Then there would be a decrease in demand for external financing from firms with a low amount of cash flows that would else resort to easy funds. In countries with strong investor protection, independent variables explaining capital structure of the firm (such as Q, stock returns, profit, and leverage) have a stronger relation with investment prediction than in low investor protection countries. Building upon the former, we develop the following hypotheses on country level effects.

- *Hypothesis 4: With an increase in shareholder protection level, deviation from the target leverage of the firms will have a positive impact on their level of debt.*
- *Hypothesis 5a: With an increase in shareholder protection level, profits of the firms will have a positive impact on their cash flows.*
- *Hypothesis 5b: With an increase in shareholder protection level, profits of the firms will have a positive impact on the level of debt and equity issuance.*
- *Hypothesis 6: With an increase in shareholder protection level, Q and stock returns will have a positive impact on equity issuance.*

3 Data Description and Methodology

3.1 Data Sample Description

All of the sample firms' data are gathered from Tomson Reuters DataStream software. A strive to capture as much energy companies as possible leads to a small bias toward companies represented by certain countries. The initial sample consists of 226 companies, with: USA—60; Australia—55; Canada—26; UK—21; India and Russia—11; Hong Kong and Israel—8; Norway and China—5; Sweden and France—4; Ireland and Argentina—2; the Netherlands, Spain, Poland, and Italy—1. For the period from 2001 until 2015, we have derived investments made by those firms into four categories (cf. Elsas et al. 2014):

1. DEBT—long term debt minus reduction in debt (DataStream items 04401 and 04701).
2. EQUITY—the issuance of new equity minus repurchase of stock (DataStream items 04251 and 04751).
3. CASHFLOW—operating cash flows, calculated as after-tax income before extraordinary items plus depreciation and amortization minus cash dividends and the increase in cash and equivalents (DataStream items 01551, 01151, 04551 and 04851).
4. OTHERS—basically all the other SCF categories for the firms.

Combined together, those four categories must be equal to total investment, or:

$$\text{INVEST} = \text{DEBT} + \text{EQUITY} + \text{CASHFLOW} + \text{OTHER} \tag{1}$$

where INVEST is the sum of the firm's capital expenditures, acquisition of assets, and investments in associated companies (DataStream items 04601, 04355, 02256). The value of mean of DEBT, EQUITY, CASHFLOW, and OTHERS as a proportion to INVEST should add up to 100%. The following mean values for those variables match the criteria: DEBT—21.9%, EQUITY—21.7%, CASHFLOW—49.7%, and OTHERS—6.7%.

The next step was to set criteria that would allow us to test a healthy sample of energy firms. Thus, we decided to remove firms that did not have any capital expenditures and other investment information, as well as firms that had no debt, cash flow expenditures and equity issuance during the time frame, or that did not report those categories. This resulted in a reduction from 226 to 147 firms.

3.2 *Estimating Targeted Leverage*

The aim of estimating the targeted leverage is to compare the trade-off hypothesis with the pecking order hypothesis and market timing hypothesis. Elsas et al. (2014) and Flannery and Rangan (2006) use market value of leverage and define it as:

$$\mathrm{Lev} = \mathrm{D}/(\mathrm{D} + \mathrm{E}) \tag{2}$$

where D—is the book value of debt (DataStream item 03255) and E is the firm's equity value. Firm's equity is expressed as the price per share multiplied by the number of shares outstanding (DataStream items P, 05301 and 05303).

Firms always face some costs when adjusting their capital structure, thus a partial adjustment model is used to describe the firms' leverage (Elsas et al. 2014):

$$\mathrm{Lev(t)} - \mathrm{Lev(t-1)} = \lambda(\mathrm{Lev(t)} * -\mathrm{Lev(t-1)}) + \mathrm{error}. \tag{3}$$

where Lev(t) and Lev (t–1) denote this year's and last year's leverage, respectively, and λ is the adjustment factor.

Elsas et al. (2014) continue that desired/target leverage is usually described as a combination of a firm's lagged characteristics X(t–1), which gives a rebuilt equation:

$$\mathrm{Lev(t)} = (\lambda\beta)\mathrm{X(t-1)} + (1-\lambda)\mathrm{Lev(t-1)} + \mathrm{error}. \tag{4}$$

where β denotes the regression coefficient of X(t–1) without the adjustment factor.

Elsas et al. (2014) confirm the line of previous studies, saying that vector X includes earnings, depreciation, fixed assets; assets market to book ratio, the natural logarithm of total assets and firm fixed effects. They did not model a constant, but include it in the estimation and find it to be insignificant. After defining a firm target leverage ratio as Lev(t)∗, they computed each firm's deviation from its targeted leverage as (the deviation was used in further models):

$$\mathrm{Dev(t)} = \mathrm{Lev(t)} * -\mathrm{Lev(t-1)} = (\lambda\beta)\mathrm{X(t-1)} - \lambda\mathrm{Lev(t-1)}. \tag{5}$$

3.3 *Evidence on Adjustment Toward Estimated Target Debt Ratios*

Elsas et al. (2014) are interested in the speed of moving toward the target leverage. So, in order to receive the value of the deviation in (5), we estimated a panel regression from (4) using the Blundell–Bond system generalized method of moments (GMM) estimation, for the data gathered from DataStream in a period from 2001 until 2015. The instruments that were used for this GMM were the second lag in leverage and the additional generated lagged variable BDR (BDR is a ratio of total debt to total assets), this is in line with the studies of Flannery and Rangan (2006) and Lemmon et al. (2008) that were referenced in Elsas et al. (2014).

The results of the GMM estimations are provided in Table 1. From the table, we can see the estimated coefficient of Lev(t–1) is 0.531, implying that the annual adjustment speed is 0.469. Having the results from Table 1, we can compute the targeted leverage for all firms in our sample and therefore can calculate deviation from its target leverage. In order to calculate the final DEV(t), we saved the predicted values of vector βX(t−1) multiplied by λ from the regression in (4) and then deduct from those values the value of λLev(t−1), see (5).

Table 1 Adjustment speed estimation

Variable (dependent: Lev(t))	Coefficient (*p*-value)
Lev(t–1)	0.531^{***} (0.000)
Profit	0.002 (0.621)
Q	-0.004^{***} (0.00)
Depreciation/TA	−0.012 (0.491)
Size	0.010^{*} (0.077)
Fixed asset ratio	0.031^{**} (0.041)
Constant	−0.004 (0.977)
N	1125 (147 firms)

***, **, and * indicate significance at 1, 5, and 10% levels, respectively

3.4 A Model for Testing Pecking Order, Trade-off, and Market Timing

We test the various capital structure hypotheses by estimating a set of four SURs (Seemingly Unrelated Regressions) in order to explain how firms pay for their investments:

$$\begin{aligned} \mathrm{F(i,t)} = {} & \alpha + \beta 1 * \mathrm{Dev(i,t-1)} + \beta 2 * \mathrm{Profit(i,t-1)} + \beta 3 \\ & * \mathrm{Stock\ return(i,t-1)} + \beta 4 * \mathrm{Q(i,t-1)} + \beta 5 \\ & * \mathrm{Investment\ ratio(i,t)} + \beta 6 * \mathrm{Fixed\ asset\ ratio(i,t-1)} + \beta 7 \\ & * \mathrm{Size(i,t-1)} + \beta 8 * \mathrm{Volatility(t-1)} + \beta 9 * \mathrm{Oil\ price(t-1)} \\ & + \mathrm{error} \end{aligned} \tag{6}$$

where:

F—the proportion of four sources of financing (Debt, Equity, Cashflow, or Others) of the firm to the firm's investment value, during year *t.*

Dev—from Eq. (5), showing the deviation from targeted leverage at year t–1.

Profit—net annual income before extraordinary items, as a proportion of book assets (Elsas et al. 2014). It is a proxy for cash flow, which is according to the pecking order hypothesis the primary source of finance.

Stock return—stock returns of the firm. According to Korajczyk et al. (1991), firms tend to issue stock, when they face an increase in stock returns. Data are obtained from the DataStream item "RI."

Q—Tobin's Q ratio, which is calculated as market value of equity to book value of equity. Authors suggest that Q may include several factors that could have an influence on corporate investing and financing behavior.

Investment ratio—the value of investments to the book total value of assets. Some investments may require additional external financing, or firms can save cash when waiting for a future investment.

Fixed asset ratio—year-end book value of fixed assets divided into total assets. A larger amount of fixed assets generates larger internal cash flows, which could reduce the use of external financing.

Size—natural log of firm's book assets, used as a control variable.

Volatility—volatility measure for the oil price. Researching oil and gas companies creates a need to address attention to external factors such as volatility. Its measurement is described by Mohn and Misund (2009).

Oil price—an additional way to control for the oil price. It is measured as the natural logarithm of average yearly oil price (Salas-Fumás et al. 2016).

The descriptive statistics are found in Table 2 and their correlation coefficients are presented in Table 3. Our primary interest is related to the first four explanatory variables, which would capture the three alternative capital structure hypotheses

Table 2 Descriptive statistics, capital structure model

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
Lev	0.22	0.19	0.94	0.00	0.18	1125
Profit	0.03	0.06	0.93	−1.56	0.16	1125
Dev	0.04	0.01	3.10	−2.43	0.41	1125
Stock return	0.19	0.06	10.41	−0.94	0.68	1125
Q	1.87	1.66	5.87	−0.55	1.13	1125
Investment ratio	0.52	0.31	12.87	−0.27	0.89	1125
Fixed assets ratio	0.61	0.64	1.91	0.00	0.25	1125
Size	13.92	14.13	19.61	4.96	2.83	1125
Volatility	1.32	1.26	2.52	0.53	0.49	1125
Oil price	4.18	4.24	4.67	3.22	0.44	1125

(Elsas et al. 2014). For example, **Dev** is measured as the difference between target and actual leverage ratios and according to the trade-off hypothesis, its coefficient should be positive (negative) in the Debt (Equity) regression, since higher profits should be accompanied by less external financing and in particular less debt financing. **Stock return** and **Q** are referred to by the market timing hypothesis. Those variables could capture opportunistic behavior with equity issuances. Alternatively, according to Elsas et al. (2014), they may also indicate an abundance of investment opportunities that goes according to the trade-off hypothesis with a preference for equity financing. **Q** by itself should be targeting leverage and it does not have any trade-off related effect in (6), but on the other hand, **Stock return** reflects different sets of investment opportunities, so it might have an influence for the trade-off interpretation in (6).

3.5 Extending a Model for Testing of Shareholder Protection Hypothesis

Elsas et al. (2014) do not account for country level factors, because their model was originally developed for US domestic companies. That is why, in order to test the shareholder protection hypothesis, we add a shareholder protection variable. In the extended model, we use an index from McLean et al. (2012) and Djankov et al. (2008). This anti-self-dealing index (*Anti-self)* is created by Djankov et al. (2008). *Anti-self* is meant to regulate an opportunistic behavior of a person who is in control over two firms, and whose transactions between those two firms have a potential objective to increase that person's own welfare. A higher value of *Anti-self* means the implication of tight regulations, which protects shareholders. Our model is:

Table 3 Correlations

	Profit	Dev	Stock returns	Q	Investment ratio	Fixedassetsratio	Size	Volatility	Oil price
Profit	1.00								
Dev	−0.06	1.00							
Stock returns	0.30	−0.39	1.00						
Q	0.16	−0.14	0.23	1.00					
Investment ratio	0.14	0.06	0.14	0.11	1.00				
Fixed assets ratio	0.01	0.07	−0.09	0.05	0.16	1.00			
Size	0.40	0.04	0.00	−0.04	−0.09	0.06	1.00		
Volatility	0.03	0.03	−0.01	−0.07	−0.06	−0.05	0.13	1.00	
Oil price	0.01	0.02	−0.02	−0.08	−0.10	0.00	0.22	*0.63*[a]	1.00

[a]There is an observable high correlation between Volatility and Oil price. That is why we decided to run separate SURs using only one variable (from the two) at one time, in order to compare the differences between outputs. Yet, the differences in the outputs were minor: all of the coefficients of the independent variables maintained their values and significance levels

$$F(i,t) = \alpha + \beta1 * Dev(i,t-1) + \beta2 * Profit(i,t-1) + \beta3 * Stock\ return(i,t-1) + \beta4 * Q(i,t-1) + \beta5 * Anti\text{-}self + \beta6 * Dev(i,t-1) * Anti\text{-}self + \beta7 * Profit(i,t-1) * Anti\text{-}self + \beta8 * Stock\ returns(i,t-1) * Anti\text{-}self + \beta9 * Q(i,t-1) * Anti\text{-}self + \beta10 * Investment\ ratio(i,t) + \beta11 * Fixed\ asset\ ratio(i,t-1) + \beta12 * Size(i,t-1) + \beta13 * Volatility(t-1) + \beta14 * Oil\ price(t-1) + error \quad (7)$$

where:

Anti-self index is a shareholder protection proxy derived from Djankov et al. (2008).

Other variables are from the capital structure model (6).

4 Results

4.1 Determinants of Financing Choices

Table 4 represents results of (6). The positive coefficient of **Dev** (0.359∗∗∗) in the Debt regression shows that underleveraged oil and gas firms use more debt financing when they deviate relatively much from their targeted level of leverage. This is consistent with *trade-off hypothesis 1* and with results of Elsas et al. (2014). The coefficient of **Dev** in the Equity regression is insignificant at −0.013. This is an indicator that at first, debt is playing a more significant role in the target adjustment toward target leverage ratio than equity, and second that this is an indicator of a specific feature that can be related to oil and gas companies, with a preference for debt issuance over equity. One standard deviation increase in **Dev** (41% in percentage points) has an impact on the entire debt funding by increasing it by $41\% * 0.359 = 14.79\%$. Thus, *trade-off hypothesis 1* receives significant support.

From the regression on cash flow, we discover that for oil and gas companies that are more profitable are eager to finance their investments with internal cash flows, the value of the coefficient for **Profit** is positive and highly significant (0.549∗∗∗). This is a clear indicator that firms that are more profitable prefer internal financing for the financing of their investments over external financing, which supports *pecking order hypothesis 2a*. However, from here additional analysis is required, because according to pecking order theory firms tend to issue debt when their internal funds can suffice investments. From our results, we can conclude that a zero coefficient of **Profit** on Debt, and a highly significant but negative coefficient in the Equity regressions are indicators that cash flow substitutes for equity issuance. This is consistent with *pecking order hypothesis 2b* (Myers 1984) but contradicts Elsas et al. (2014).

From the regression on Equity, it is possible to derive results for *market timing hypothesis 3*. Stock returns are considered to be the most important factor for the

Table 4 SUR estimates

Dependent variable	Debt	Equity	Cashflow	Others
Dev	0.359*** (0.00)	−0.013 (0.62)	−0.221*** (0.00)	−0.097*** (0.01)
Profit	−0.009 (0.87)	−0.471*** (0.00)	0.549*** (0.00)	0.018 (0.83)
Stock return	0.033*** (0.00)	0.06*** (0.00)	−0.068*** (0.00)	0.005 (0.79)
Q	0.01*** (0.00)	−0.007** (0.03)	−0.003 (0.56)	−0.002 (0.56)
Fixed assets ratio	−0.004 (0.91)	0.049 (0.23)	0.556*** (0.00)	−0.416*** (0.00)
Investment ratio	−0.001 (0.39)	0.00 (0.85)	−0.002 (0.36)	0.003 (0.15)
Size	0.00 (0.91)	−0.036*** (0.00)	0.02*** (0.00)	0.019*** (0.00)
Volatility	−0.058*** (0.01)	0.022 (0.38)	0.05 (0.2)	0.008 (0.81)
Oil price	0.093*** (0.00)	−0.018(0.53)	−0.102** (0.02)	−0.01 (0.81)
Constant	−0.266*** (0.01)	0.648*** (0.00)	0.207 (0.22)	0.343** (0.02)
N	1125	1125	1125	1125
R^2	0.186	0.167	0.138	0.063

***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively

market timing theory, because they could capture the opportunistic behavior with equity issuances. The positive **Stock return** coefficient in the Equity (0.06∗∗∗) regression indicates that firms use higher stock returns to finance their investments. The positive and significant coefficient of **Stock return** on Debt (0.033∗∗∗) represents a signal to lenders that a firm has growth opportunities, which reduces uncertainty and thus leads to more debt issuance. Additionally, a negative and significant coefficient of **Stock return** on Cashflow demonstrates that with high returns firms tend to substitute internal investments with debt and equity, thus giving additional indirect support to the pecking order theory. The significant but negative coefficient on **Q** (−0.007∗∗∗) adds zero additional support for the *market timing hypothesis 3*. Therefore, with mixed results about *market timing hypothesis 3*, it can be partially supported.

The remaining coefficients for the control variables have their own effect on funding. Insignificant values of the **Investment ratio** coefficient indicate that oil and gas firms prefer not to issue additional source of funding when they want to make a certain investment—they are constantly spending funds for investment purposes. **Fixed asset ratio** coefficients show that firms with more tangible assets rely more on internal funds (the coefficient for Cashflow is positive and significant at 0.556∗∗∗), which confirms Elsas et al. (2014) in that tangible assets generate greater depreciation related cash flows. The **Size** coefficient shows no impact on Debt issuance, while showing a significant but negative coefficient for Equity (−0.036∗∗∗) and a positive/significant coefficient for Cashflow (0.02). The coefficient on Equity can be explained by uncertainties and fear of having undervalued equity from managers who are running a relatively large company. The positive value on Cashflow is related to the same issue: because of that uncertainty, they prefer to use internal funds. The firm level control variable conclusions can be linked to the pecking order theory. **Volatility** and **Oil price** represent macro-level control variables. The results are quite expectable—an increase in oil price volatility would decrease the amount of debt issued to oil and gas companies because of the increased level of global uncertainty—the coefficient on **Volatility** is significant and negative at −0.058∗∗∗. An **Oil price** increase would have an opposite effect, raising the value of possible Debt issue, with a positive and significant coefficient of 0.093∗∗∗. Additionally, **Oil price** has a significant but negative effect on Cashflow, indicating that in periods of high oil prices (decreasing levels of uncertainty for stakeholders), oil and gas firms tend to use external financing in terms of debt instead of their own funds—the coefficient being −0.102∗∗.

4.2 The Role of Shareholder Protection

From Table 5 it can be drawn that the value of coefficient on **DEV** has increased compared to Table 4, but this is partially offset by the interaction value between **DEV** and Anti-self index. With these results, it is possible to calculate the overall coefficient of **DEV** for the maximum and minimum values (Hong Kong and The Netherlands: NL, the list of all values is in Appendix A) of the Anti-self index. For example, by focusing on the results from regression with the dependent variable Debt, for Hong Kong—[0.807 + 0.96∗(−0.605) = 0.226]; for NL—[0.807 + 0.2∗(−0.605) = 0.686]. Both of these coefficients are positive, which lead to the acceptance of the *trade-off theory hypothesis 4*. The coefficient of 0.226 is lower than previously reported in Table 4 (0.359), indicating that firms in the high Anti-self countries do not have high deviations from their targeted leverage, compared with countries with a small Anti-self index (the value for **DEV** is for NL 3 times bigger than for Hong Kong).

The regression on Cashflow shows a significant value for **Profit** (1.024), which is higher than reported in Table 4 (0.549). The value of the interaction coefficient **Anti-self** and **Profit** is insignificant, but it is important to derive the overall coefficient on **Profit** since the coefficient of stand-alone variable **Profit** is still statistically significant. For Hong Kong it is maximal at 1.024 + 0.96∗(−0.625) = 0.424 and for NL it is minimal at 0.807 + 0.2∗(−0.625) = 0.682. Having positive results for the overall profit coefficient is not enough to satisfy criteria for *pecking order theory, hypothesis 5a*. Because the interaction coefficient is insignificant, our sample does not support this hypothesis. Despite being insignificant, the overall coefficient shows us that in high Anti-self index countries companies prefer to use less internal cash flows than

Table 5 SUR estimates with shareholder protection variables

Dependent variable	Debt	Equity	Cashflow	Other
Dev	0.807*** (0.00)	−0.004 (0.97)	−0.718*** (0.00)	−0.396** (0.02)
Profit	−0.004 (0.99)	−0.567* (0.08)	1.024** (0.05)	−1.469*** (0.00)
Stock return	0.307*** (0.00)	−0.107** (0.05)	−0.035 (0.67)	−0.057 (0.46)
Q	−0.058*** (0.00)	−0.01 (0.60)	−0.02 (0.46)	0.036 (0.15)
Anti-self	0.006 (0.94)	0.099 (0.25)	−0.032 (0.8)	−0.324*** (0.01)
Dev∗ anti-self	−0.605*** (0.00)	−0.038 (0.81)	0.745*** (0.00)	0.414* (0.08)
Profit∗ anti-self	−0.016 (0.97)	0.123 (0.77)	−0.625 (0.35)	1.947*** (0.00)
Stock return∗ anti-self	−0.321*** (0.00)	0.228*** (0.00)	−0.062 (0.57)	0.066 (0.51)
Q∗anti-self	0.091*** (0.00)	0.005 (0.84)	0.025 (0.5)	−0.051 (0.14)
Fixed assets ratio	0.018 (0.62)	0.064 (0.12)	0.563*** (0.00)	−0.492*** (0.00)
Investment ratio	−0.002 (0.27)	0.001 (0.78)	−0.002 (0.37)	0.004 (0.13)
Size	0.002 (0.57)	−0.033*** (0.00)	0.02*** (0.00)	0.014*** (0.01)
Volatility	−0.056*** (0.01)	0.02 (0.41)	0.046 (0.23)	0.005 (0.88)
Oil price	0.091*** (0.00)	−0.026 (0.35)	−0.096** (0.03)	−0.003 (0.95)
Constant	−0.301*** (0.01)	0.57*** (0.00)	0.201 (0.32)	0.656*** (0.00)
N	1125	1125	1125	1125
R^2	0.218	0.175	0.146	0.073

***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively

in countries where this index is low (the value for **Profit** for NL is 1.6 times bigger than for Hong Kong).

The value of **Profit** for the dependent variable Equity is negative and significant (−0.567), and smaller than the value in Table 4 (−0.471). The value of the interaction coefficient is not significant, but still the overall value of the coefficient on **Profit** in Equity is for Hong Kong −0.567 + 0.96∗(0.123) = −0.449 and for NL it is −0.567 + 0.20∗(0.123) = −0.542. In countries with high Anti-self index, Cashflow substitutes less for equity issuance than in countries with lower Anti-self index values. Because the interaction coefficient is insignificant, we do not have sufficient evidence for the *pecking order theory, hypothesis 5b.*

In regression with the dependent variable Equity, the values of coefficients on **Stock return** and its interaction with Anti-self are significant. The coefficient on the **Stock return** is negative but the interaction variable has a positive coefficient. With an increase of the shareholder protection level, as presented by Anti-self index, the overall influence of the **Stock return** would increase. The values are for Hong Kong $-0.107 + 0.96 * (0.228) = 0.112$ and for NL $[-0.107 + 0.20 * (0.228) = -0.061$. With the increase in shareholder protection as represented by Anti-self index there is an increase in **Stock return**, which affects Equity issuance. The mean value of Anti-self index is 0.667, indicating an overall average value of **Stock return** of 0.045. The coefficients on Q for Equity, are not significant for both **Q** and its interaction with Anti-self. Thus, this leads us to the partial support of the *market timing theory, hypothesis 6* (in the countries with a high Anti-self index).

5 Conclusions and Limitations

The main goal of this chapter is to discover what factors affect the decisions of oil and gas companies to finance their investments. We aim to fill the gap between studies on the capital structure for oil and gas versus other companies. In order to do so, we collect data from 18 countries, for 147 oil and gas companies having relevant data for the period from 2001 until 2015. For analyzing the data, we follow methods used by Elsas et al. (2014) to test capital structure hypotheses and by McLean et al. (2012) to test for shareholder protection hypotheses. In order to test capital structure hypotheses, we calculate the target leverage deviation, using a methodology by Flannery and Rangan (2006) whereby we calculate the speed of capital structure adjustment (using GMM estimation). Having all of the required variables, we compute a system of Seemingly Unrelated Regressions in order to test the capital structure hypothesis.

Our results show that the dynamic trade-off theory receives significant support, indicating that oil and gas companies are using a large proportion of debt in their activities in order to meet a target leverage level. Viewed from the country level, the dynamic trade-off theory receives significant support as well, indicating additionally that firms in countries with a high shareholder protection level have less deviation from their targeted leverage (and as a result want to take on less debt) than firms in countries with less shareholder protection.

The pecking order theory receives mixed support. We show that highly profitable oil and gas companies indeed use their income (or internal financing) for financing investments, which is in line with pecking order theory. Yet, we also find support for substitution of internal cash flows by equity in both capital structure and shareholder protection issues, which is not perfectly in line with pecking order theory. Additionally, on shareholder protection, we find out that oil and gas companies that face a low level of internal funds tend to issue debt, which is in line with pecking order theory. Country level differences are found to be insignificant.

The market timing theory meets partial support in relation to capital structures and country levels. High stock returns of the oil and gas companies significantly influence equity issuance in countries with a high shareholder protection index. This effect reduces with the level of shareholder protection and can be even negative.

Our study has some flaws. It is limited to 18 countries with a great representation of the USA, the UK, Australia, and Canada. Those countries have in general well-developed stock markets with a large number of companies functioning since the 1980s, while companies from other countries are functioning since the 1990–1995 years. This problem could be overcome later when there will a greater amount of companies from different countries, considering that a vast majority of those companies started to report their activities since the 2005–2008 years.

Our research can be used from a managerial perspective as well. The main finding is that oil and gas companies highly rely on debt and internal funds in all countries, while the financing by equity is not so important in low shareholder protection countries, which have low or late stock listings and low equity values. For investment purposes, oil and gas companies count more on internal funds (with 50% of the investment financed by cash flows) than on equity and debt (22% each), consistent with Elsas et al. (2014). Managers should be aware that oil and gas companies, when adjusting toward the targeted leverage level, mainly rely on debt and not on equity issuance. Country level factors are playing a significant role as well, affecting mainly debt and equity issuance, consistent with McLean et al. (2012). Oil and gas companies tend to issue equity in countries with high shareholder protection, where high values correspond with countries with long history of stock listings and high equity values, with the level of shareholder protection not being relevant for debt taking.

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