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TITLE: Oil and gas companies' capital expenditure announcements and the stock market's responses

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Foreword

This thesis is the conclusion to my two-year long studies, pursuing a Master of Science in Business Administration with a specialization in Applied Finance at the University of Stavanger. The process of writing this thesis has been both challenging and a great educational experience.

I would like to thank my supervisor, Professor Klaus Mohn, for his excellent guidance, advice and availability during this semester. I would also like to thank my friends and family, especially my girlfriend Marie, for all their support and motivation during my studies.

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Abstract

This thesis attempts to find possible explanations to the research problem: Why does the stock prices of oil and gas companies not always respond in accordance with neoclassical standard financial theory when companies announce changes in capital expenditure plans? The research problem is deeply rooted within principal-agent theory, and to find answers two theories are applied. First, neoclassical standard financial theory, that assumes all market participants are rational (Becker, 1962). Second, behavioral corporate finance theory, with the biased managers perspective, that assumes managers are biased due to overconfidence, while all other market participants are rational (Baker & Wurgler, 2013; Malmendier, 2018).

To solve the research problem empirically, two hypothesis are tested. First, to answer whether the news presented on the event days have any effect on the behavior of the firms' stock prices. Three event studies are conducted to find evidence of abnormal return responses to eight integrated oil and gas companies' announcements. The three models confirms correlations, where news including plans to increase capital expenditure, result in statistically significant negative average cumulative abnormal return responses ranging from -0.33 to -2.00 percent in the different event windows. Second, to answer whether the capital expenditure news have any effect on the behavior of the firms' stock prices. Three regression analysis attempts to determine if the capital expenditure news cause abnormal (daily) return responses. One analysis reveals causality, if the firms increase capital expenditure, they experience a statistically significant negative abnormal (daily) return response of -1.66 percent.

The stock market's negative responses are first discussed within neoclassical standard financial theory, where abundant free cash flow and increased managerial power might have caused rational overinvestment in negative net present value projects (Jensen, 1986; McConnell & Muscarella, 1985). Strengthening the issue, managers' compensation contracts were potentially misaligned in the sample period (Hall & Liebman, 1998; Hall & Murphy, 2000, 2002). Second, within behavioral corporate finance theory, the responses might indicate that managers are overconfident, causing irrational overinvestment in negative net present value projects (Malmendier & Tate, 2008). Both theories point towards excessive use of internal funds as the culprit of the stock market's negative responses. Where restricting managers' use of internal financing, improving the boards of directors and monitoring are potential solutions (Baker & Wurgler, 2013; M. Harris & Raviv, 1990; Jensen, 1986; Malmendier & Tate, 2005, 2008, 2015).

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1. Introduction

This thesis attempts to find possible explanations to the research problem: Why does the stock prices of oil and gas companies not always respond in accordance with neoclassical standard financial theory when companies announce changes in capital expenditure plans? The research problem is deeply rooted within principal-agent theory, and to find answers two theories are applied. First, neoclassical standard financial theory, that assumes all market participants are rational and thus maximize their own utility or profit consistently (Becker, 1962). Second, behavioral corporate finance theory, specifically the biased managers perspective, where executives are assumed to be biased due to overconfidence while all other market participants are rational (Baker & Wurgler, 2013; Malmendier, 2018). Biased managers believe they are, but are in fact not maximizing their own and shareholders' value. Biased managers fail to maximize their utility or profit consistently and are therefore irrational (Becker, 1962).

Every year, firms announce their planned capital expenditure. These announcements signal to the market how much firms will invest in real assets in the coming year. The oil and gas industry has been chosen as the focus of this thesis, due to the fact that oil is the most important primary energy resource in the world (International Energy Agency [IEA], 2018c). In 2016, oil and natural gas accounted for 31.9 and 22.1 percent respectively of the world's total primary energy supply by fuel. Also in 2016, oil and gas investments account for 650 billion United States dollar (USD) of an estimated 1.7 trillion USD in total energy investments (IEA, 2017). As a result, it is important to obtain valuable insights into integrated oil and gas companies' investment and capital structure decisions. As potential deviating stock price behavior from neoclassical standard financial theory could lead to over- and underinvestment. Casual observations of the integrated oil and gas companies' capital expenditure announcements could indicate that this is the case.

This thesis contributes with evidence that the stock market responded negatively to eight integrated oil and gas companies' announcements of increased capital expenditure in the sample period. This deviates from neoclassical standard financial theory, where an increase in capital expenditure is a signal to the market of increased future positive net present value (NPV) projects and therefore increased firm value and share price, as shareholders would immediately benefit from the investment projects (McConnell & Muscarella, 1985). To find potential explanations, the thesis starts by presenting investment theory and the relevance of capital structure, payout policy and agency theory. Following the presentation of neoclassical standard financial theory, behavioral corporate finance theory is applied to provide explanations for the managers' and the other market participants' behavior. To solve the research problem empirically, two hypothesis are tested. To answer the first hypothesis, whether the news presented on the event days have any effect on the behavior of the firms' stock prices, three event studies are presented: The constant mean return model, the market-adjusted return model and the market model. To answer the second hypothesis, whether the capital expenditure news have any effect on the behavior of the firms' stock prices, the regression analysis is presented. Finally, to gain insight into rational and irrational overinvestment, relevant academic literature to the research problem is presented.

Following the theory and literature, the data collection process and the historical retrospect of the oil and gas industry during the sample period is included, to provide context into how these companies present their capital expenditure plans. In addition, the historical retrospect presents the market conditions the firms have been exposed to in the sample period. Where the industry experienced a volatile oil price with following changes in stock price, capital expenditure, cash flow from operating activities and free cash flow (FCF). The sample consists of the following eight integrated oil and gas companies: Equinor, BP, Royal Dutch Shell (Shell), Eni, Total, Chevron, ExxonMobil, and ConocoPhillips. Their capital expenditure announcements date back to 2008 and until 2018, with 88 total announcements in the sample. Due to the need for a benchmark denoted in a common currency, Dow Jones U.S. Oil & Gas Titans 30 Index, denoted in USD has been chosen. This benchmark covers the 30 leading companies in the global oil and gas industry, including the firms in the sample.

Following the presentation of the data collection process and the industry's historical retrospect, the three event studies and regression analysis are conducted to estimate and test the thesis's two hypothesis. The three event studies confirms correlations, where the announcements including increased capital expenditure plans result in statistically significant negative average cumulative abnormal return responses ranging from -0.33 to -2.00 percent in the different event windows. However, announcements including news of status quo and decreases in capital expenditure plans reveals mixed responses. The regression analysis applies the abnormal returns from the three event studies and one model reveals causality. The stock market's responses to increases in capital expenditure are negative. If the firms announce an increase in capital expenditure, they experience statistically significant negative abnormal (daily) return response of -1.66 percent. The regression analysis also finds that the supermajors and the American integrated oil and gas companies in the sample experience statistically significant negative abnormal (daily) return responses ranging between -1.50 to -1.62 percent and -1.00 percent respectively. While the government-sponsored enterprises (GSEs) and European firms experience exactly the opposite respectively. If the firms increase production with 1 million barrels of oil equivalent (mmboe) and proved reserves with 1 billion barrels. It causes statistically significant negative abnormal (daily) return responses ranging between -0.41 to -0.55 percent and -0.15 to -0.19 percent respectively.

First, within neoclassical standard financial theory, the negative responses to increased capital expenditure might indicate that abundant FCF and increased managerial power have caused rational overinvestment in negative net present value projects (Jensen, 1986; McConnell & Muscarella, 1985). Strengthening the issue, executives' compensation contracts potentially did not optimally align managers' and shareholders' interests in the sample period (Hall & Liebman, 1998; Hall & Murphy, 2000, 2002). Second, within behavioral corporate finance theory, the negative responses might indicate that managers are overconfident, causing irrational overinvestment in negative NPV projects and the stock market responded by lowering the firms' stock prices (Malmendier & Tate, 2008). Both theories point towards excessive use of internal funds as the culprit of the stock market's negative responses to increases in capital expenditure. Where restricting managers' use of internal financing, improving the boards of directors (boards) and monitoring are potential solutions to reduce overinvestment and improve the stock market's responses (Baker & Wurgler, 2013; M. Harris & Raviv, 1990; Jensen, 1986; Malmendier & Tate, 2005, 2008, 2015).

The thesis is structured the following way, where Chapter 2 presents the theory and literature related to the research problem. While, Chapter 3 presents the data collection process and the historical retrospect of the oil and gas industry during the sample period. In Chapter 4, three event studies and regression analysis are conducted to estimate and test the thesis's two hypothesis. Chapter 5 discusses the results from Chapter 4 in the light of the theory and literature presented in Chapter 2 and the historical retrospect from Chapter 3. Finally, in Chapter 6 the thesis is concluded.

2. Theory and literature review

Chapter 2 presents the theory and literature related to the research problem, where Section 2.1 presents investment theory relating to the managers' capital expenditure decisions. Such as the NPV decision rule, the capital asset pricing model (CAPM) and the weighted-average cost of capital (WACC). Section 2.2 presents the relevance of capital structure, payout policy and agency theory. While Section 2.3, adds research from behavioral corporate finance theory to provide explanations for the managers' and the other market participants' behavior. Section 2.4 divides the research problem into two hypothesis, attempting to simplify the task of solving the research problem empirically with the following three event studies: The constant mean return model, the market-adjusted return model and the market model. These three event studies creates three regression analysis, and the approach is presented. The chapter concludes in Section 2.5 with a literature review summarizing relevant academic literature within investment and agency theory, in addition behavioral corporate finance theory.

2.1 Investment theory

The NPV method calculates the value of an investment opportunity (i) while considering alternative investments and the time value of money (J. Hirshleifer, 1958). The method involves examining the present values (PV) of the investment's cash inflows and outflows. The NPV investment decision rule states that, all positive NPV investment projects should be undertaken when considering the appropriate discount rate, the cost of capital, where higher positive NPV projects are preferred. These types of projects maximize firms' value by increasing their PV and therefore shareholders' value. If the NPV of the project is negative, firms should not invest, as it would be a value-destroying endeavor by overinvesting in an unprofitable project for their shareholders (Ross, 1995). This is also the case for a zero NPV investment opportunity, as it creates no value for the firm's shareholders.

$$NPV_i = \sum_{t=1}^{\infty} \frac{CF_{it}}{(1 + r_i)^t} \tag{2.1}$$

In Equation (2.1), investment opportunity i's net present value is (NPV_i) and the investment's cash flows at time t is (CF_{it}), these cash flows are positive if the cash inflows are dominating while the opposite is true if the cash outflows dominates. In addition, investment opportunity i's appropriate cost of capital is (r_i). The NPV method is the preferred investment decision rule as it should produce correct results if the appropriate cost of capital is known, provided by a perfect capital market (J. Hirshleifer, 1958). Too high estimates of the cost of capital leads to rejection of projects and underinvestment by the firm, while too low estimates leads to accepting value-destroying investments and overinvestment. It is therefore important for managers to estimate the proper cost of capital associated with each individual project to make correct capital budgeting decisions.

CAPM's security market line (SML) is commonly used in capital budgeting to estimate the appropriate cost of capital for firms' investment projects (Krüger, Landier & Thesmar, 2015). Value maximizing firms optimally use the NPV decision rule to evaluate investment projects for the following year, adding worthwhile projects to the next year's capital budget. CAPM relies on a set of strict assumptions. First, investors are rational and risk averse, thus evaluating investment opportunities according to the mean-variance criterion (Fama & French, 2004; Lintner, 1965; Sharpe, 1964). They choose the dominating investment that has the highest expected return and lowest variance, compared to alternative investments. Second, investors in aggregate plan for a single time period and all have access to the same information, creating homogenous investor expectations (Fama & French, 2004; Sharpe, 1964). Third, the market is well functioning, meaning there are no imperfections (Lintner, 1965). Finally, all assets in the economy is tradeable creating a market portfolio and borrowing and lending is possible at the risk-free rate (Fama & French, 2004; Lintner, 1965; Sharpe, 1964).

Investors are exposed to nondiversifiable systematic risk when investing in a company and requires compensation for this type of risk (Ben-Horim & Levy, 1980; Sharpe, 1964). Such as swings in the business cycle that affects the whole economy and is unavoidable for the investor. In contrast, investors do not receive compensation for diversifiable unsystematic risk, as it is possible to avoid with a well-diversified portfolio. This type of risk is due to new information that has an impact on a single firm's stock price. Equation (2.2) shows the SML and calculates the expected cost of capital of investment opportunity i ($E[r_i]$) given the project's systematic risk beta (β_i), where (r_f) represents the risk-free rate and ($E[r_m]$) represents the expected market return (Fama & French, 2004):

$$E[r_i] = r_f + \beta_i(E[r_m] - r_f) \tag{2.2}$$

By subtracting the risk-free rate from the expected market return, it results in the market risk premium $(E[r_m] - r_f)$. Which is the compensation investors expect to earn while holding the well-diversified efficient market portfolio. The market risk premium is a result of a beta equal to one and all investors holding the market portfolio on the minimum variance frontier in equilibrium. This is due to the strong model assumptions in CAPM, where all investors will hold identical risky portfolios, aggregating into the market portfolio. The aggregated market risk is equal to one as a covariance $(cov(r_i, r_m))$ with itself is equal to its respective variance $(var(r_m))$:

$$\beta_i = \frac{cov(r_i, r_m)}{var(r_m)} \tag{2.3}$$

An investment opportunity with a beta higher than one will result in investors requiring a return above the market risk premium, as they must hold greater amounts of systematic risk, while the opposite is true for a beta lower than one (Sharpe, 1964). Krüger et. al. (2015) argues that by finding the investment's beta, one can estimate the appropriate cost of capital for the investment opportunity. The authors argue further that CAPM is relevant in capital budgeting if beta provides systematic risk information, even though there is evidence that the model is not capable of accurately calculating expected return from the investment in question.

The complicated part of calculating an investment's cost of capital is that not all assets are tradable as assumed by CAPM (Fama & French, 2004). To account for this, firms can calculate their WACC, which is the appropriate discount rate of an investment opportunity when considering constant debt (D) and equity (E) and the tax shield from debt in perfect capital markets (Miles & Ezzell, 1980). In Equation (2.4), (r_E) is the equity cost of capital, the return shareholders demand, and (r_D) is the debt cost of capital, the return bondholders demand, while (τ_C) is the tax rate:

$$r_{WACC} = \frac{E}{E + D} r_E + \frac{D}{E + D} r_D (1 - \tau_C) \tag{2.4}$$

There is an interest tax shield $(1 - \tau_C)$ while holding debt, providing an incentive and advantage for firms through tax deduction, lowering their taxable income, and thus causing tax savings (R. S. Harris & Pringle, 1985; Miles & Ezzell, 1980). The interest tax shield reduces the firm's WACC and therefore increases their investment's levered market value (V_0^L), which in turn increases the firm's value:

$$V_0^L = \sum_{t=1}^{T} \frac{FCF_{it}}{(1 + r_{WACC})^t} \tag{2.5}$$

In Equation (2.5), investment opportunity i's free cash flow at time t is (FCF_{it}). This is the expected remaining cash flows originating from the investment, which shareholders could receive after all value-creating investments are made (Jensen, 1986).

2.2 Capital structure, payout policy and agency theory

Modigliani and Miller (1958) presents conditions for a perfect capital market characterized by no market inefficiencies resulting in all securities being correctly valued. They argue that firms' capital structures are irrelevant in such a market, as there is no difference between financing projects with debt or equity. The reason for this is that the cost of capital is equal to the interest rate on bonds and therefore both financing options have the same impact on the firms' cash flows. When considering tax benefits and bankruptcy penalties, managers have to balance between their firms' financing options (Kraus & Litzenberger, 1973; Robichek & Myers, 1966). The cost of capital differs due to the chosen amount of debt. Too much debt increases the risk of equity, as there is a greater chance of financial distress, insolvency and defaulting on equity holders' share of the firms' cash and decreasing the firms' value. Managers trade-off between debt and equity and choose the optimal capital structure that maximize the net benefits of debt and their firms' values (Jensen, 1986; Korteweg, 2010). Firms with high amounts of leverage will experience reduced benefit of debt, while the opposite is true for firms with low amounts of leverage.

Managers must decide how to allocate their firms' FCFs. They can pay dividends, repurchase shares or they can retain earnings for future positive NPV projects. M. H. Miller and Modigliani (1961) argues that in perfect capital markets with rational investors and perfect certainty about investment outcomes, dividends and retained earnings are equally valuable to shareholders given the firms' investment policies. The payout policies effects' cancel each other out and does not influence the value of the firm. When considering taxes, a share repurchase policy would increase share price and therefore firm value if capital gains tax were lower than income tax, leading to greater value for shareholders (Grullon & Michaely, 2002).

The research problem is deeply rooted within principal-agent theory, which looks at the relationship that occurs with separation of ownership and control between share and bondholders (principals), and managers (agent) hired to act out the principals' interests (Jensen & Meckling, 1976). If principals' and agents' wealth is sufficiently tied together, rational managers will maximize the owners' welfare as they wish to maximize their own value (Becker, 1962; Jensen & Meckling, 1976). If this is not the case, executives will have incentives to follow their own interests at the expense of the principals' interests (Jensen & Meckling, 1976; Malmendier, 2018). This leads shareholders to endure agency costs due to an agency problem, as managers lack the incentive to maximize the owners' value (Jensen & Meckling, 1976). This is the case when executives deviate from the value maximizing NPV decision rule.

Being on the inside of the firm, executives have more information about how the firm is truly doing than outsiders, otherwise called asymmetric information (M. H. Miller & Rock, 1985). A problem arises because of the uncertainty surrounding the inside information of managers (Ross, 1977). Considering that the market knows that executives have incentives to signal that their firm is of a better type than they really are. Using incentive-signalling by linking executives' compensation to a credible signal and a potential penalty due to bankruptcy when issuing an untrue signal. This incentivizes managers to take on the amount of debt that maximize their compensation and signals to the market that their inside information is true. With an untrue signal, the managers' penalty is potentially losing their jobs due to financial distress, not necessarily due to the firms' bankruptcy costs. In addition, for the signal to be trustworthy, the managers' incentive contract is required to have restrictions on trading and short selling as to avoid short-term false signals to boost compensation.

Another problem relates to issuing equity when financing new investment projects because of adverse selection, where Akerlof (1970) presents the lemon principle and Leland and Pyle (1977) expands upon it. Without a credible signal to shareholders, where managers invest in their firms' stocks. Investors have no way of confirming the information regarding the presented projects by the firms' executives. This leads to below average firms, or "lemons", pressuring those above average out of the market, leaving an adverse selection of "lemons" left. Therefore, investors will require a price discount to be willing to buy the firms' new equity, as investors perceive that only "lemons" will issue new stocks.

Asymmetric information problems related to the equity issues presented above, leads executives to prefer internal financing and debt (Myers, 1984). If firms prefer internal over external means and debt over equity when they choose their capital structure, they follow the pecking order hypothesis of financing. The firms will first try to finance projects with internal means, which is the firms' cash inflows or accumulated profits. If this is not enough to finance investments, external means are required, where safe debt followed by debt with lower priority is issued, while equity is the least preferred means of financing. When managers have asymmetric information that would benefit themselves or long-term shareholders, they will not issue new shares to finance positive NPV projects if the dilution to long-term shareholders is greater than the gains from the projects (Myers & Majluf, 1984). To avoid this, firms can hold sufficient amounts of cash on hand to finance all positive NPV projects available to them (Myers, 1984).

Hall and Liebman (1998) argues that a way to solve these agency problems are for firms to create optimal compensation contracts that incentivize managers to align their interests with shareholders' interests. Firms achieve this by issuing or selling sufficient amounts of stocks and options to executives. The authors argue further that the optimal compensation contract for a risk neutral manager that perfectly aligns shareholders' and managers' interests, is a contract where the manager's pay is equal to the firm's value, selling the firm to the manager. They argue that this could be appropriate for small firms due to their small values, however for large firms it is not. Considering that managers have limited funds and are potentially risk averse, the firm's volatility and high value decreases managerial incentives. Focusing on the option compensation contracts, as the stock price of the firm increases, both shareholders' and managers' wealth increases. In the case where the stock price decreases below executives' options strike price, managers' compensation will be valueless and out-of-the-money reducing their incentives. However, the optimal compensation contract is still effective if risk-averse managers still have a high probability of exercising in-the-money, as rational executives will try to maximize their own value and utility consistently (Becker, 1962; Hall & Murphy, 2000, 2002).

Repricing is the resetting of options' exercise price when the company's stock price have fallen (Hall & Murphy, 2002). Repricing might be effective in some cases in order to realign incentives when options are too far out-of-the-money, and to avoid the possibility of managers leaving the company when it is exposed to a competitive executive labor market (Carter & Lynch, 2001; Chidambaran & Prabhala, 2003; Hall & Murphy, 2002). However, as Hall and Murphy (2002) argues, repricing "forgives" poor manager performance and creates potential exploitable managerial incentives.

By assuming risk-averse executives and managerial value maximizing behavior, a sufficiently high probability that the options will be in-the-money at expiration (thus repricing is not required) and that there are sufficient time restrictions on exercising options (Hall & Murphy, 2000, 2002). In addition, that the options are non-tradable and managers do not have the possibility of short-selling or hedging their compensation. Executives will pursue increased stock prices, maximizing the value of their shareholders when provided optimal compensation contracts. Without these types of contracts, executives will have incentives to invest in negative NPV projects to attain a variety of private benefits instead, such as in the case of empire building (Hall & Liebman, 1998). In addition, executives may reject positive NPV projects characterized with higher risk, due to their risk aversion surrounding the possibility of losing their wages.

2.3 Behavioral corporate finance theory

Malmendier (2018) presents three biased perspectives within behavioral corporate finance theory; biased investors, biased managers and biased third parties. In all these perspectives, it is assumed that one participant is irrational expressing non-standard behavior. While the others are rational by expressing standard behavior and taking advantage of their irrational counterpart. As presented by Becker (1962), in economics, rational behavior assumes that market participants maximize their own utility or profit consistently. Thus, economic irrational behavior from the market participants would occur when they fail to maximize their utility or profit consistently. Agency problems are strengthened due to irrationality, and this thesis will focus on irrational biased managers who have the responsibility of taking capital expenditure decisions on behalf of the firms' investors.

The biased managers perspective looks at executives' biased behavior resulting in deviations from neoclassical standard financial theory. In their presentation of the perspective, Baker and

Wurgler (2013) assumes that the market and the investors in it are fully rational while managers' behavior is inconsistent with rational expectations and expected utility maximization. Irrational and biased managers believe they are, but are in fact not maximizing their own and shareholders' value (Baker & Wurgler, 2013; Malmendier, 2018).

A possible reason for the deviation from neoclassical standard financial theory is that people tend to be overconfident (Odean, 1998). Malmendier (2018) presents overconfidence as consisting of two components, overoptimism and miscalibration. First, overoptimism is the tendency for people to be overly optimistic about the future and their probability of success (D. Hirshleifer, 2001; Odean, 1998). Overoptimistic managers tend to overestimate the valuation of mean returns from their companies' cash flows, when they are considering projects in their own firms and possible synergies as a result of mergers (Ben-David, Graham & Harvey, 2013; Malmendier, 2018). Second, miscalibration is the tendency for people to perceive that their information is more precise than what it is true, by providing too narrow probability distributions when presenting their confidence intervals (Ben-David et al., 2013; D. Hirshleifer, 2001; Lichtenstein, Fischhoff & Phillips, 1982; Odean, 1998). When considering miscalibrated managers, they tend to underestimate their firms' possible future outcomes (Ben-David et al., 2013; Malmendier, 2018). Such as the standard deviation of their firms' cash flows, or overestimate the information provided by signals during decision-making.

Overconfidence is hard to correct and Ackert and Deaves (2016) presents three biases given from attribution theory that potentially makes it so (Ackert & Deaves, 2016, p. 114). First, self-attribution bias is the tendency to believe successful outcomes are due to own abilities, therefore increasing individuals' confidence (Gervais & Odean, 2001; D. T. Miller & Ross, 1975). While failed outcomes are believed to be caused by factors outside individuals' control and they are therefore not to blame for their failures. Second, hindsight bias is the tendency for individuals to think they could have predicted the outcome of an event, after the event has occurred, when they know the results of the event (Hawkins & Hastie, 1990). Third, confirmation bias is the tendency for individuals to look for and agree with information that is fitting with their thoughts and ideas, while disagreeing, ignoring and being critical of information that does not support their views (Ackert & Deaves, 2016; Lord, Ross & Lepper, 1979). In addition to these biases, overconfidence increases as the complexity of the tasks increases and if the tasks are only completed a few number of times, there is little feedback to learn from one's mistakes (D. Hirshleifer, 2001).

High-ranking executives are assumed to be a relatively homogenous and a self-selected group, as they have chosen this career path and have been successful in climbing the corporate ladder (Goel & Thakor, 2008; Malmendier, 2018). In addition, boards also perceives managerial positions to demand certain characteristics in order to be successful. In comparison to individual investors, executives' decisions have consequences for others than themselves and it is therefore important to obtain a broad understanding of issues relating to biased managers (Malmendier, 2018). A problem with research on this perspective is the low frequency of executives' decisions, their numbers and self-selected nature. Considering that executives' tasks are generally complex, unique and they thus receive little feedback to learn from their mistakes, it is therefore possible that overconfidence is common among executives (D. Hirshleifer, 2001).

Baker and Wurgler (2013) shows with the following simple model, why irrational managers overinvest and choose capital structure in line with the pecking order hypothesis of financing. The authors argue that this is due to executives' overoptimism concerning their firms' fundamental value $(f(I,\cdot) - I)$ and proposed new investment projects (I). Where $(f(I,\cdot))$ is a production function that is concave and increasing in investment. The model assumes that irrational managers have to balance two contrary tasks in a perfect capital market and that they have compensation contracts. First, managers will try to maximize their firms' perceived value on behalf of their shareholders. Biased managers believe their firms are higher valued than what the efficient market states, this overoptimism is measured by an optimism parameter (γ) about their own companies and investment projects. Second, shareholders expect managers to minimize the cost of financing future investment opportunities by reducing the perceived cost of capital. Executives perceives it as expensive to issue new equity (e) as in their minds the efficient market undervalues their companies by $(\gamma f(I,\cdot))$. Therefore, overconfident managers will not issue equity because of perceived dilution $(e\gamma f(I,\cdot))$ and will rely on the pecking order hypothesis of financing. Below, (2.6) presents the managers' perceived fundamental valuation of the firm:

$$(1+\gamma)f(I,\cdot) - I \qquad (2.6)$$

Executives believes their firms are undervalued by the efficient market if $\gamma > 0$. They fear dilution and therefore decreased value for themselves and shareholders by issuing stocks. If $\gamma = 0$ there is no managerial overoptimism or perceived dilution and the managers value their firms the same way as the perfect capital market. Below, (2.7) presents perceived dilution due to issuing new equity:

$$e\gamma f(I,\cdot) \tag{2.7}$$

To maximize perceived firm value and avoid dilution for themselves and shareholders, managers will maximize (2.8) when considering the proposed new investments and their financing options:

$$\max_{I,e}(1+\gamma)f(I,\cdot) - I - e\gamma f(I,\cdot) \tag{2.8}$$

To find the amount managers are willing to invest in their proposed investments, one must differentiate (2.8) with respect to I:

$$f_I(I,\cdot) = \frac{1}{1+(1-e)\gamma} \tag{2.9}$$

If γ is sufficiently large when considering the proposed investment and in addition the firms have sufficient cash and debt, it reduces the need to raise external capital by issuing e, managers will irrationally overinvest in the projects using internal funds and debt. This will cause the proposed projects to become value-destroying negative NPV investments for both shareholders and executives. With a belief that their firms are undervalued, managers will not issue sufficient amounts of e to optimally offset their γ. To understand why managers decide to finance their proposed new investments by following the pecking order hypothesis of financing, one must differentiate (2.8) with respect to e:

$$(1+\gamma)f_e(I,\cdot) = \gamma(f(I,\cdot) + ef_e(I,\cdot)) \tag{2.10}$$

The left-hand side of Equation (2.10) is the perceived loss due to a changed capital structure, while the right-hand side represents the perceived loss from dilution. Overoptimistic executives will balance these two outcomes when deciding how to finance their projects, and will therefore never issue new equity, as this type of managers perceives issuing equity as costly.

2.4 Hypothesis, event studies and regression analysis

2.4.1 The thesis's hypothesis

Neoclassical standard financial theory states that, an increase in capital expenditure is a signal to the market of increased future positive NPV projects and therefore increased firm value and share price, while the opposite is true for a decrease in capital expenditure (McConnell & Muscarella, 1985). Therefore, the first null hypothesis (H_0^1) states that, the news presented on the event days have no effect on the behavior of the firms' stock prices. While the first alternative hypothesis (H_A^1) states that, the news presented on the event days have an effect on the behavior of the firms' stock prices (MacKinlay, 1997). The second hypothesis is more precise, where the second null hypothesis (H_0^2) states that, the capital expenditure news have no effect on the behavior of the firms' stock prices. While the second alternative hypothesis (H_A^2) states that, the capital expenditure news have an effect on the behavior of the firms' stock prices. These two hypothesis can potentially provide answers to the thesis's research problem presented in Chapter 1.

2.4.2 Changes to capital expenditure

McConnell and Muscarella (1985) presents a naïve model of investor anticipation of capital expenditure announcements. The model relies on an assumption that investors expects a continuation of the status quo, where ($E[I_t]$) is the expected amount of capital expenditure in year t:

$$E[I_t] = I_{t-1} \tag{2.11}$$

Therefore, (I_{t-1}) is the amount of capital expenditure that was announced in year $t-1$, while the amount of capital expenditure announced in year t is (I_t). If $I_t > I_{t-1}$, there has been an unexpected increase in capital expenditure, while the opposite is true for $I_t < I_{t-1}$.

2.4.3 The event studies

MacKinlay (1997) argues that event studies are widely used in finance to calculate the change in a firm's value. The author argues further that if markets are assumed to be rational and therefore efficient, it will react instantly to any news relevant to a firm, and thus an event study should be able to capture this response. Following the author, the analysis starts by collecting historic stock prices for the event of interest, also denoted as the event day, and the time before and after the event day. The event window is the period of interest that is studied, the time before the event window is the estimation window, while the time after the event window is the post-event window. Then the task is to adjust the stock price movements by comparing them to a relevant benchmark to be able to measure the true effect on the firm's stock price to comparable firms over the event window. The abnormal return for firm i at the event of interest τ is $(AR_{i\tau})$. This is the extraordinary firm-specific return resulting from the event, which is the difference between the actual return on the event day τ $(R_{i\tau})$ and the normal expected return without considering the announcements $(E(R_{i\tau}|X_{\tau}))$:

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau}|X_{\tau}) \tag{2.12}$$

In Equation (2.12), (X_{τ}) indicates which model calculates the normal returns.

Henderson (1990) argues that how the actual returns are calculated might not matter that much, but most event studies in the literature calculate it as continuously compounded returns. Where (R_{jt}) is the actual return of the stock or benchmark in time t:

$$R_{jt} = \ln(\frac{P_{jt+1}}{P_{jt}}) \tag{2.13}$$

While (P_{jt+1}) is the stock or benchmark price in time $t + 1$, and (P_{jt}) is the stock or benchmark price in time t. The benefits of using continuously compounded returns are that they are normally distributed (Dimson & Marsh, 1986; Henderson, 1990).

This thesis uses the three following models to calculate normal returns to obtain abnormal returns: The constant mean return model, the market-adjusted return model and the market model. First, Equation (2.14) presents the constant mean return model, which was used by both Brown and Warner (1985) and MacKinlay (1997) and is their simplest presented approach to obtain normal returns. Subtracting firm i's average stock return from the whole estimation period $(\bar{R}_i)$ by firm i's actual stock return in period τ $(R_{i\tau})$ yields:

$$AR_{i\tau} = R_{i\tau} - \bar{R}_i \tag{2.14}$$

Second, Equation (2.15) presents the market-adjusted return model (Brown & Warner, 1985; Dimson & Marsh, 1986; MacKinlay, 1997). Which is also a simple approach to obtain normal returns that subtracts an appropriate index benchmark's (m) actual return in period τ $(R_{m\tau})$ from $R_{i\tau}$ and yields:

$$AR_{i\tau} = R_{i\tau} - R_{m\tau} \tag{2.15}$$

Dimson and Marsh (1986) argues that this approach is quite useful when studying short event windows as a biased calculation of $AR_{i\tau}$ is likely small. Over longer event windows, the approach suffers from lack of robustness due to the size effect. This is a consequence of potential misspecification of $R_{m\tau}$, as the benchmark is possibly diversified and much larger than the individual firm's stock making the stock more volatile. Due to misspecification $AR_{i\tau}$ and $R_{i\tau}$ becomes negatively correlated around the event causing wrongful significant results.

Finally, the statistical ordinary least squares (OLS) market model presented by MacKinlay (1997) will be applied, as it enables us to get a clearer picture of the event's effects and the abnormal return variance. This is achieved by a reduced abnormal return variance when applying the regression, as the model excludes the return resulting from the market return variance. This is indicated by a higher coefficient of determination (R^2):

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2.16}$$

In Equation (2.16), (R_{it}) is the actual stock return in time period t, (α_i) and (β_i) are both parameters, where α_i is the intercept parameter. While (R_{mt}) is the return from the market portfolio in time period t and (ε_{it}) is the error term in time period t. A well-behaved residual that represents the firm-specific return. The market-adjusted return model is quite similar to the market model. MacKinlay (1997) presents the market-adjusted return model as a restricted market model with constrained and constant α_i equal to zero and β_i equal to one (MacKinlay, 1997, p. 18). The market model looks at the firm's stock return when considering their systematic risk exposure and the return from alternative stock investments in the market. Following Equation (2.16), Equation (2.17) is used to calculate $AR_{i\tau}$ in the market model:

$$AR_{i\tau} = \varepsilon_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \tag{2.17}$$

To specify the presented models correctly, MacKinlay (1997) includes a model assumption that stock returns are jointly normal distributed. Following MacKinlay's (1997) event study approach further in Equation (2.18) to (2.22). To be certain that the events of interest from a sample of firms actually have an impact on the stock prices and the market reacts to new information. One must find the average abnormal return ($\overline{AR}_\tau$) from a number of previous events (N), then standardizing the accompanying dates into event time in the estimation and event windows:

$$\overline{AR}_\tau = \sum_{i=1}^{N} \frac{AR_{i\tau}}{N} \tag{2.18}$$

Next, the variance of the average abnormal returns from the estimation window is calculated:

$$var(\overline{AR}_\tau) = \sum_{i=1}^{N} \frac{\sigma_{\varepsilon_i}^2}{N^2} \tag{2.19}$$

Calculating the cumulative abnormal return (CAR) to account for the possibility of information leakage to the market and late reactions. Cumulative abnormal returns captures the possible changes in the stock price before, on and after the event date. The average cumulated abnormal return from the event window is ($\overline{CAR}(\tau_1, \tau_2)$):

$$\overline{CAR}(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_\tau \tag{2.20}$$

To determine the statistically significance of the analysis a two-sided t-test is run with the average cumulative abnormal return from the event window of interest. In practice, it is common to use the variance of average abnormal returns in Equation (2.19) as an estimator for [$var(\overline{CAR}(\tau_1, \tau_2))$]:

$$var(\overline{CAR}(\tau_1,\tau_2)) = \sum_{\tau=\tau_1}^{\tau_2} var(\overline{AR}_\tau) \tag{2.21}$$

Putting all these equations together makes it possible to test whether the first null hypothesis is correct, by calculating the cumulative abnormal test statistic (θ_1) using a two-sided t-test (Browner & Warner, 1985; MacKinlay, 1997):

$$\theta_1 = \frac{\overline{CAR}(\tau_1,\tau_2)}{var(\overline{CAR}(\tau_1,\tau_2))^{1/2}} \sim N(0,1) \tag{2.22}$$

Using the average cumulative abnormal return approach to run a two-sided t-test can determine if the event had an effect on the event day and over multiple trading days.

2.4.4 The regression analysis

To be able to provide systematic evidence of abnormal returns following changes in firms' capital expenditures, this thesis applies regression analysis to test the second hypothesis. The analysis starts using Equation (2.23), with the dependent variable $(AR_{i\tau})$, the constant (α), a parameter (β) on the independent variable capital expenditure change (ΔI), and including the error term (ε_τ) at time τ:

$$AR_{i\tau} = \alpha + \beta\Delta I + \varepsilon_\tau \tag{2.23}$$

By providing data from firms' changed capital expenditures and their abnormal returns over several years, a regression analysis can provide more precise answers than the event studies used to test the first hypothesis. The regression analysis can potentially answer whether changes in capital expenditure truly cause a systematic effect on the behavior of the firms' stock prices.

$$AR_{i\tau} = \alpha + \beta\Delta I + \sum_i \gamma_i x_{i\tau} + \varepsilon_\tau \tag{2.24}$$

Expanding the regression analysis to a multiple regression analysis in Equation (2.24) could potentially improve the analysis' precision by adding more statistically significant independent variables. Where (γ_i) is the parameters on the independent variables $(x_{i\tau})$ at time τ.

Following Mohn and Osmundsen (2011), the regression analysis can be expanded to include asymmetric dynamics (ADs) for the capital expenditure changes:

$$\Delta I^{+} = \begin{cases} \Delta I \ \forall \ \Delta I > 0 \\ 0, otherwise \end{cases}, \ \Delta I^{-} = \begin{cases} \Delta I \ \forall \ \Delta I < 0 \\ 0, otherwise \end{cases} \tag{2.25}$$

In (2.25), the dummy variables for increase in capital expenditure (ΔI^{+}) and decreases in capital expenditure (ΔI^{-}) are defined.

$$AR_{i\tau} = \alpha + \beta_1 \Delta I^{+} + \beta_2 \Delta I^{-} + \sum_i \gamma_i x_{i\tau} + \varepsilon_\tau \tag{2.26}$$

In Equation (2.26), the dummy variables for increase and decrease in capital expenditure is added with their respective parameters (β_1) and (β_2). The dummy variables enables the use of a t-test to determine whether the market responds symmetrically or asymmetrically to the firms' capital expenditure changes. Where the asymmetric dynamic null hypothesis ($H_0^{AD}\colon \Delta I^{+} = \Delta I^{-}$) states that, increases and decreases in capital expenditure lead to an identical symmetric market response. While, the asymmetric dynamic alternative hypothesis ($H_A^{AD}\colon \Delta I^{+} \neq \Delta I^{-}$) states that, the market responds asymmetrically to the different types of announced capital expenditure changes.

2.5 Literature review

The following review will summarize literature on the topic of capital expenditure plans and share price formation, providing possible explanations for both topics found in neoclassical standard financial theory and behavioral corporate finance theory.

2.5.1 Capital expenditure and stock prices

McConnell and Muscarella (1985) studied the effects on firms' stock prices following future capital expenditure plan announcements to find whether managers signaled valuable information to the market. They used an event study approach and their research was extensive consisting of 658 corporations divided into industrial and public utility firms between 1975 and through 1981. They questioned whether the market reacted according to traditional valuation theory, which indicates they believed managers followed the market value maximization hypothesis or in other words, the NPV decision rule. If true, the market would then increase the firms' stock price when capital expenditure was increased and decrease the firms' stock price when capital expenditure was decreased. Increasing capital expenditure plans signals an increase in future positive NPV projects, while the opposite is true for a decrease in capital expenditure. Therefore, traders rationally increase or decrease firms' stock prices if the possibility of future earnings growth increases or decreases. This was the case for industrial firms in the sample. In addition, consistent with traditional valuation theory and the maximization hypothesis where firms with an expected cost of capital that was equal to the market risk premium. These firms will not experience changes in stock prices with changes in capital expenditure, as their stocks are zero NPV investments. This was the case for public utility firms in the sample.

An interesting exception found by McConnell and Muscarella (1985) was that oil and gas companies in their sample allocating increased or decreased capital to exploration and development in oil and gas fields experienced opposite reactions than expected from traditional valuation theory. When the oil and gas companies increased capital expenditure their announcement period return decreased by -0.55 percent, while the comparison period mean return experienced an increase of 0.28 percent. By decreasing capital expenditure, their announcement period return increased by 1.49 percent while their comparison period mean return increased by 0.27 percent. Such reactions would indicate that the market believed managers do not follow the market value maximization hypothesis and rationally overinvest in negative NPV projects in exploration and development.

Jensen (1986) presented evidence from the oil industry in the 1970s and 1980s. Which was a period characterized by increases in oil prices and therefore increased FCFs with accompanying agency problems for the oil companies. The author argued as the oil consumption fell, future expected increases in oil price also fell. Leading to increased cost of capital expenditure as the industry peaked in the late 1970s and early 1980s. Firms still earned great profits and chose to reinvest their FCFs in negative NPV exploration and development projects instead of paying it out to their shareholders. In addition, managers spent FCF on unnecessary value-destroying takeovers to diversify their companies and build empires for themselves to rule.

2.5.2 Rational overinvestment and moral hazard

Rational executives' behavior can cause overinvestment, where rational overinvestment literature apply neoclassical standard financial theory and principal-agent theory, which assumes that all market participants are rational (Becker, 1962).

Jensen (1986) contributes with the free cash flow theory, which states that managers' power, increases with the available FCF in the company. An agency problem emerges when managers do not increase the firm's payout policy to distribute this cash to shareholders. They fear that managers avoid monitoring and will spend FCFs on value-destroying negative NPV projects. To avoid such asymmetric information, managers can use debt instead of dividends to signal that they are acting in their stakeholders' best interest, since debt reduces the amount of FCF that could be used on bad investments.

Harford (1999) continues Jensen's (1986) work by looking at the relationship between excess FCFs and acquisitions. Harford (1999) finds support for the free cash flow theory with evidence that firms with abundant FCFs and resulting reduced monitoring, was more likely to acquire another company in value-destroying bids, indicated by their insufficient synergy and reduced stock price.

M. Harris and Raviv (1990) expands on Jensen's (1986) idea and argues that to maximize shareholders' value, managers need disciplining debt, creating important information to enable investors to make better decisions. Since executives do not want their firms liquidized and, in the process, lose their jobs, they try their best to avoid signaling to the market that this is required. Debt is a useful signal of the state of the firm and the quality of managers through the firm's ability to service their debt. If a firm is unable to keep up with payments, this information can influence creditors' decision to either allow the firm to continue operating or decide to liquidate it. As debt have higher seniority than equity, creditors will receive their claim either way. This gives shareholders incentive to pressure managers to choose the optimal capital structure with the amount of disciplining debt that allows for proper monitoring and maximizes the firm's value.

Graham and Harvey (2001) study whether managers utilize corporate finance theory by using the NPV decision rule, proper cost of capital estimation in their projects and follow neoclassical standard financial theory in their choice of capital structure. Using an extensive sample of 392 chief financial officers (CFOs), they find that large firms mostly use the NPV or internal rate of return (IRR) rule, while small firms tend to use the payback, NPV and IRR rule to an equal extent. When it comes to cost of capital most firms use CAPM for the calculation, especially large firms. They found a problem that a majority of firms used a company-wide cost of capital instead of a project specific cost of capital when deciding to invest, which can lead to wrongful valuation of projects. In addition, the authors found that managers tend to choose their capital structure in accordance with keeping financial flexibility, a good credit rating and avoiding dilution rather than balancing between the costs and benefits of the different financing options. This was consistent with parts of the pecking order hypothesis of financing.

Krüger et. al. (2015) continues Graham and Harvey's (2001) work using both neoclassical standard financial theory and behavioral corporate finance theory by studying the "WACC fallacy". Which is firms' tendency to use a wrongful company-wide cost of capital when evaluating projects found in Graham and Harvey's (2001) study. Focusing on neoclassical standard financial theory and the results, Krüger et. al. (2015) argues that when a firm uses such a discount rate instead of a project-specific rate when applying the NPV decision rule they will overvalue and therefore overinvest in riskier than average projects for the firm, while the opposite is true for projects with lower risk than average. They found evidence for the "WACC fallacy" in some cases. Where the firms applied the discount rate relevant to the firms' main divisions in other divisions with different risk characteristics. In addition, using an event study approach of firms' stock price effects following acquiring bid announcements. The authors found that when firms used their lower company-wide discount rate, they tended to overbid, destroying-value for their shareholders.

2.5.3 Irrational overinvestment and overconfidence

Irrational executives' behavior can also cause overinvestment. Irrational overinvestment literature apply behavioral corporate finance theory with the three biased perspectives (Malmendier, 2018). Which assumes that one of the three market participants are irrational, while the others are fully rational. Section 2.5.3 focuses on the biased managers perspective.

Roll (1986) examines if corporate takeovers are value-creating or destroying by presenting the hubris hypothesis that individual managers tend to bid too much due to valuation error. When valuing a company, the target firm's equity and reasons for potential current market price reductions are considered. In addition, their potential synergies with the acquiring firm and future improvements in management. It is expected of managers to bid if the calculated value is higher than the current market price, while the opposite is true if the value is below current market price. The author argues further that hubris cause managers to undertake value-destroying bids.

Heaton (2002) examines managerial optimism in a simple model where overly optimistic managers decline positive NPV investments and accept negative NPV investments, resulting in an underinvestment-overinvestment tradeoff. Managers decline positive NPV investments due to an irrational belief that the market is undervaluing their shares, making required external financing costly and therefore creating a preference for internal funds. Having FCF on hand is therefore a benefit to shareholders in this case, as the firm avoids underinvestment, but there is also a cost to have abundant FCF. Overly optimistic managers irrationally overestimates the return from investment projects, leading them to believe the NPV is positive for their projects, but in reality, they are negative NPV projects. This causes irrational overinvestment in negative NPV projects, as managers have abundant FCF on hand and therefore only require internal funds to invest.

Malmendier and Tate (2005) continues the work of Roll (1986) and Heaton (2002) and argues that firms overinvest due to irrational managerial overconfidence. This is contrary to the traditional view of rational overinvestment caused by agency problems and asymmetric information. The authors argue that with abundant internal funds and limited monitoring from the market and boards, overconfident managers who systematically overestimates their projects' returns will irrationally overinvest. The preference for internal funds are due to chief executive officers' (CEOs') view that their firms are undervalued by the market causing them not to issue new equity. Considering they do not want to dilute value for long-term shareholders. Therefore, managers are sensitive to their firms' investment cash flows. If executives must collect external funding when their firms have little cash available, managers cut positive NPV investments.

Malmendier and Tate (2005) argues that to align the interests of shareholders and managers, CEOs receive compensation in terms of stocks and options. The authors was the first to create a model that could detect overconfidence using these optimal compensation contracts. They argue as CEOs are risk averse and poorly diversified with their human capital and wealth invested in their respective firms, they are rationally expected to exercise in-the-money options to be able to diversify. Considering the restrictions on CEOs' compensation contracts, not to trade their options or exercise before a certain time has passed, to avoid incentives for short-run stock price increases. In addition, not allowing short-sales of the firms' stocks. The authors found that overconfident CEOs would not exercise their options at an optimal time, instead believing in further growth for their firms. The authors argue further that with managerial overconfidence, optimal compensation contracts fail to align managers' and shareholders' interests. To avoid overinvestment in negative NPV projects when managers irrationally believe they are maximizing their own and shareholders wealth, boards needs to be active and independent to improve the firms' corporate governance structure. Where the boards need to restrict the use of internal financing, potentially by debt overhang.

Malmendier and Tate (2005) discuss other rational reasons why CEOs might wait to exercise their options and argues it could be a consequence of procrastination. They argue this is common for most people, but it seems unlikely due to the trading activity in overconfident CEOs' personal portfolios. CEOs might wish to signal to the market that their firms have great-expected future performances. In addition, CEOs might hold in-the-money options due to higher risk tolerance and therefore a lower utility from diversification. Managers may also try to exploit insider information or obtain tax benefits, however, the authors argue that none of these alternative reasons are sufficient at explaining the phenomenon.

Malmendier and Tate (2008) continues their overconfidence research by looking at CEOs' mergers and acquisitions in the U.S. They find that there is a higher probability for CEOs to undertake value-destroying mergers when they have the necessary internal cash flows to do so. In addition, the market responds negatively to the overconfident CEOs' mergers. The reason for this is that overconfident CEOs irrationally believe that they can create more value then they rationally can, both within their own firms and in other firms. The market reacts negatively to merger bid announcements of overconfident CEOs by lowering the stock prices of acquiring firms, signaling that they believe these CEOs are overpaying or making unnecessary diversifications. The authors use another overconfidence measure by analyzing the press for signs of overconfidence. The measure found that confidence or optimistic characterizations of CEOs to be an accurate way of detecting CEOs' overconfidence.

Ferris, Jayaraman, and Sabherwal (2013) confirms Malmendier and Tate's (2008) work by looking at CEOs' mergers and acquisitions at a global scale. They also used the media-based approach when measuring overconfidence and found that the bias affects the number of acquisitions and not only for diversifying purposes. Overconfidence also influenced the frequency of bids and the use of internal cash flows to finance the mergers and acquisitions. All these characteristics where observable outside the U.S., especially for CEOs in Christian countries due to a focus on individualism and a preference for a short-term perspective. In addition, these characteristics was also observable in countries where the mother tongue is English.

Further, Malmendier, Tate and Yan (2011) argues that overconfident CEOs prefer debt to equity to a degree where they will take on about 33 cents additional debt per USD of required external funds when financing projects compared to rational CEOs.

Malmendier and Tate (2015) reviews new concepts and literature on managerial overconfidence over the last decade and updates their research from their 2005 and 2008 articles. The authors provide key and clarifying insights into the concept of irrational managerial overconfidence where they argue that CEOs will only overinvestment when their firms have sufficient internal funds and have the possibility of obtaining correctly valued risk-free debt. This is consistent with the pecking order hypothesis of financing, as CEOs believe the market undervalues their firms' shares. This results in CEOs not issuing new equity, as they fear it will cause dilution to shareholders value. Overconfident CEOs' investment decisions are therefore sensitive to the amount of internal funds and risk-free debt their firms have available. The authors argue that rational CEOs do not follow a pecking order structure, as they will not distinguish between the choices of financing. Rational CEOs will therefore invest in all available positive NPV projects. In addition, with the option-measure for overconfidence, the authors found that about 40 percent of CEOs in their sample could be identified as overconfident.

Ben-David et. al. (2013) found in their study that the average CFO is miscalibrated. They came to this conclusion using 13 300 80 percent confidence interval return forecasts from 2001 to

2011 on the S&P 500. CFOs only hit 36 percent of the time within their forecast interval, meaning they inhabited overprecision, having too narrow expectations of the future returns on S&P 500. With more uncertainty in the market, managers' miscalibration increased, in addition these CFOs had a higher degree of aggressive investment behavior, where they invested more and took on more debt relative to other managers. These CFOs was also found to be miscalibrated about their respective firms' future project returns.

Otto (2014) found that principals pay optimistic CEOs less compensation compared to rational CEOs as their future views of the company is overly positive and therefore, they overvalue their compensation. Optimistic CEOs need less compensation to offset their risk aversion and take on the risk that the principals requires that they take. The article includes Malmendier and Tate's (2005, 2008) popular options-based measure of overconfidence and adds a new measure of optimism. Where Otto (2014) looks at the announced earnings per share (EPS) forecasts compared to the actual revealed EPS. Optimistic CEOs have irrational positive expectations of their firms. The author argues that this should be observable when comparing irrational CEOs' forecasted and realized EPS to rational CEOs.

Another measure of overconfidence used by Graham, Harvey and Puri (2013) are personality tests. The authors test CEOs and CFOs to document their overconfidence, using the survey-based approach. They found that CEOs are more optimistic than the population including CFOs, in addition CEOs are more risk-tolerant then the general population. In their study 1 180 CEOs and 1 276 CFOs responded, of these CEOs 80.2 percent was found to be very optimistic. Optimism and risk-tolerance where found to have an impact on the amount of short-term debt and acquisitions CEOs would make respectively. Where a higher amount of optimism would lead to a greater amount of debt, and a higher risk-tolerance would lead to more acquisitions by the CEOs.

Goel and Thakor (2008) argues that overconfident managers are more likely to become CEOs as they win intrafirm tournaments for their positions. Caused by the optimal corporate governance structure promoting tournaments that favors higher perceived ability. Overconfident managers underestimate risks and are more risk tolerant, this leads them to take on more risks and achieve better investment returns when they succeed than rational managers. The authors argue further that because of the intrafirm tournaments favoring overconfident managers this might cause there to be more overconfidence among CEOs relative to the general population. Boards will however not tolerate all forms of overconfidence, where moderately overconfident CEOs keeps their jobs while excessive overconfidence results in managers losing their jobs.

Managerial overconfidence is not only negative, there are positive sides of overconfidence. Gervais, Heaton, and Odean (2011) argues that moderate amounts of overconfidence can be positive for firms by reducing the compensation they need to pay in order to align CEOs' and shareholders' interests. As a result, the managers take on the amount of risk that the shareholders demand. In addition, everyone involved might benefit more from an overconfident manager as they increase their commitment to the firm's investments and therefore increase the likelihood of success. D. Hirshleifer, Low, and Teoh (2012) argues that overconfident CEOs are preferred in industries that are defined by innovation and growth as they tend to invest more in risky and challenging research and development (R&D) projects. While Campbell, Gallmeyer, Johnson, Rutherford and Stanley (2011) argues that moderate CEO optimism can be valuable by increasing the firm's investments to the optimal level by counteracting risk aversion.

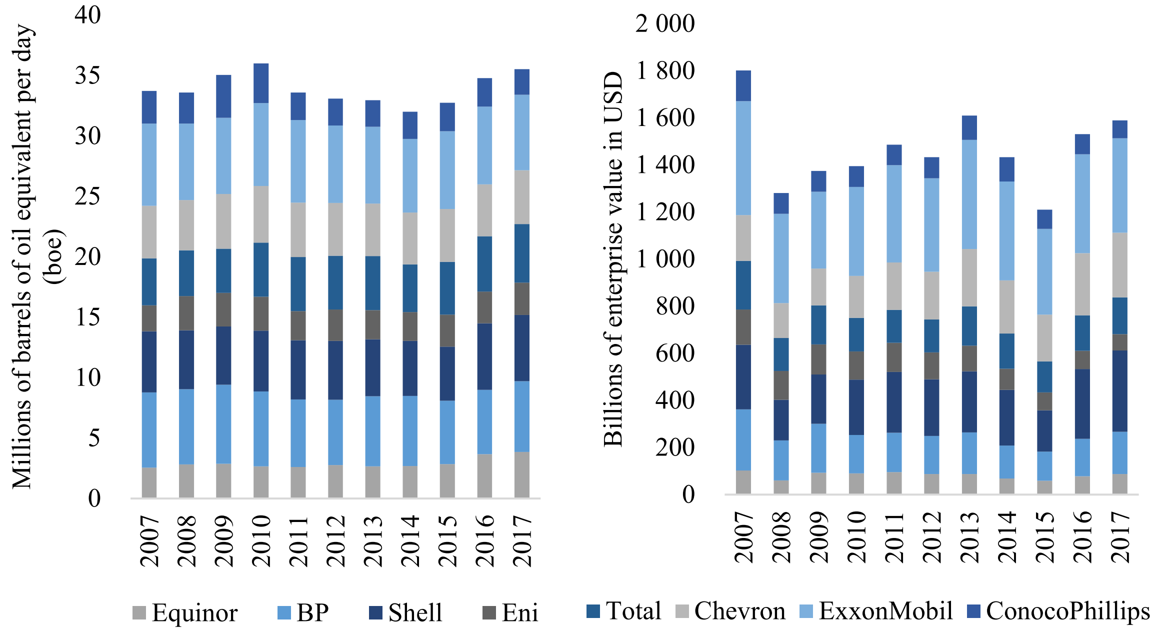
3. Historical retrospect

Chapter 3 presents the data collection process in Section 3.1, while Section 3.2 presents the oil and gas industry and the industry's historical retrospect during the sample period.

3.1 Data collection

Data from the following eight integrated oil and gas companies have been collected: Equinor, BP, Shell, Eni, Total, Chevron, ExxonMobil, and ConocoPhillips. Where all companies except Equinor and Eni are international oil companies (IOCs) also called supermajors (Hilyard, 2012). In contrast, Equinor and Eni are hybrid companies as they are GSEs, meaning they are partially government and publicly owned.

Figure 3.1 Cumulative oil and gas production and enterprise values



Note: The oil and gas production was collected from the eight integrated oil and gas companies' "Operating Metrics", while the companies' enterprise values was collected from their "Ratios – Profit/Value/Risk", using Thomson Reuters Eikon. Eni's enterprise value was denoted in Euro (EUR), but has been converted to USD using relevant average yearly exchange rates.

The reason for the choice of these companies are due to their influence on the global oil and gas industry as illustrated in Figure 3.1, which shows their massive daily oil and gas production and the firms' huge enterprise values. In addition, the firms provide reliable capital expenditure announcements dating back to 2008. National oil companies (NOCs) have not been included in the sample, even though they are among the largest oil and gas companies in the world, as these firms tend to hide information from the market (Van Vactor, 2010). Due to the need for a benchmark denoted in a common currency, Dow Jones U.S. Oil & Gas Titans 30 Index, denoted in USD is used. This benchmark covers the 30 leading companies in the global oil and gas industry, including the firms in the sample.

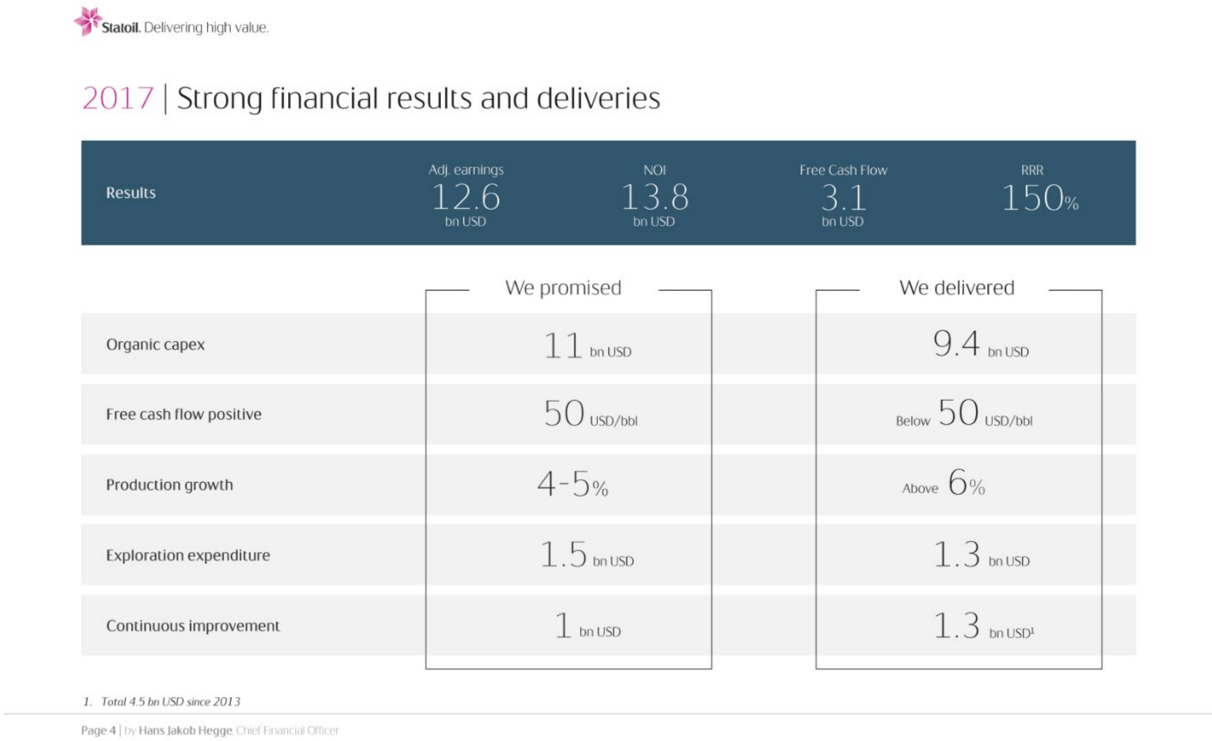
Thomson Reuters Eikon has been used to collect the stock, benchmark and oil prices, where the stock prices are obtained from a common exchange, The New York Stock Exchange (NYSE), and they are denoted in USD. The event day τ is the announcement of the year's capital expenditure. For the event studies, stock and benchmark prices are collected from 2007 to 2018 to obtain a wider estimation window (MacKinlay, 1997). Data for the event window was also collected where, stock and benchmark prices from December, January, February, March and April for the period 2007 until 2018 was obtained.

Following McConnell and Muscarella's (1985) criteria for inclusion in the sample, all the firms' final announcements of their capital expenditure and future plans from 2008 until 2018 was included. This was done to be able to compare the previous year's spending to the planned spending the following year. There are some differences in how firms present capital expenditure, used as a general term in this thesis. In addition, some firms have changed how they present their capital expenditure over the years. The firms usually present capital expenditure in the following ways: Equinor, BP, Eni, Shell, Total and ExxonMobil announce it as capital expenditure, capex, organic capex and disciplined capex, where ExxonMobil adds the "disciplined" part. Shell also announce capital expenditure as capital investment, while Total announce it as net investments. ConocoPhillips announce it as capital expenditures and investments and in addition as capital program. Chevron presents capital expenditure as capital and exploratory expenditures. Considering the different ways in providing information to the market, this can cause some additional differences between what the firms announce in their presentations and what they actually use. However, the market reacts first to the numbers presented in the announcements and these numbers therefore seem more appropriate to use in an event study as they are forward looking.

Most firms' capital expenditure announcements occur in late January and throughout February during their fourth quarter earnings announcements, strategy announcements and full year reviews. This is where the capital expenditure forecast data in the sample originates from. Some firms deviate from this pattern, where ExxonMobil tends to announce capital expenditure at their analyst meetings in March, while in 2008 their planned capital expenditure was found in a Form 10-K from the United States Securities and Exchange Commission (SEC). Chevron has also announced capital expenditure plans during an analyst meeting in March 2018. While ConocoPhillips announce capital expenditure plans in their fourth quarter announcements in late January and early February and sometimes includes it in their annual reports in late February. All companies denote their capital expenditure in USD, except Eni who denotes it in Euro (EUR). Using Thomson Reuters Eikon, the EUR to USD exchange rate has been collected to calculate yearly average exchange rates to convert Eni's capital expenditure values to USD. If there were no reference to the previous year's budget in the reviewed presentations or transcripts, but the planned next year's capital expenditure was included. The annual reports was used to obtain the delivered capital expenditure in the respective year (McConnell & Muscarella, 1985). When this occurred, the event date was still set to be the announcement of next years planned capital expenditure. In addition, only yearly planned announcements was added to the sample, capital expenditure plans covering several years was not included.

An example of how the data collection process went can be provided from Statoil's fourth quarter 2017 "Capital markets update" in London, February 7, 2018 (Equinor, 2018). Note, to avoid confusion, Statoil changed their name later that year to Equinor on May 15, 2018 (Equinor, 2019). In this announcement, Equinor presented their "2017 Strong financial results and deliveries" shown in Figure 3.2 below:

Figure 3.2 Equinor’s delivered capital expenditure in 2017


Statoil. Delivering high value.

2017 | Strong financial results and deliveries

Results	Adj. earnings	NOI	Free Cash Flow	RRR
	12.6 bn USD	13.8 bn USD	3.1 bn USD	150%

	We promised	We delivered
Organic capex	11 bn USD	9.4 bn USD
Free cash flow positive	50 USD/bbl	Below 50 USD/bbl
Production growth	4-5%	Above 6%
Exploration expenditure	1.5 bn USD	1.3 bn USD
Continuous improvement	1 bn USD	1.3 bn USD[1]

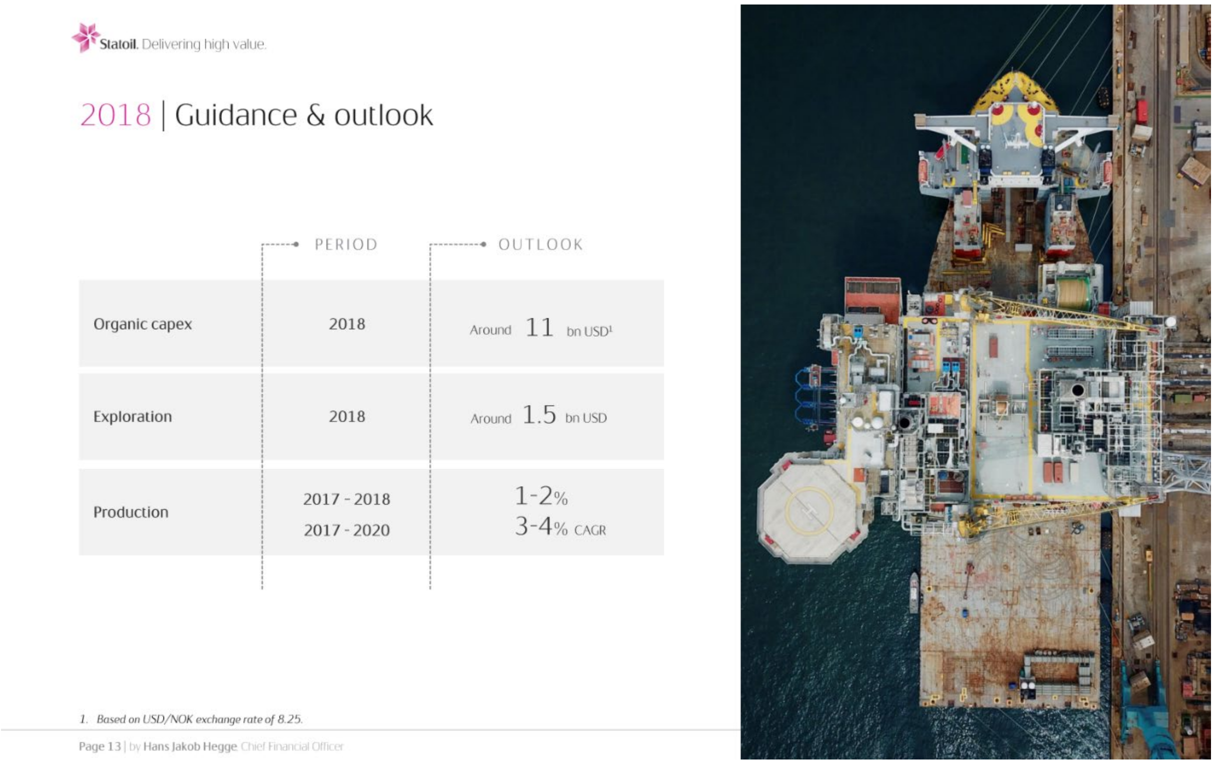
1. Total 4.5 bn USD since 2013

Page 4 | by Hans Jakob Hegge Chief Financial Officer

Source: (Equinor, 2018, p. 4)

In Figure 3.2, Equinor restates their planned capital expenditure for 2017 at 11 billion USD and presents their actual capital expenditure for the year at 9.4 billion USD, where the actual spending contributes to the sample. Since Equinor presents these numbers as “Strong financial results and deliveries”, one can interpret the figure as Equinor bragging about cutting capital expenditure as that would be any good for the firm’s future growth prospects and development. To find the last piece of the puzzle, the planned next year’s capital expenditure, and obtain information about Equinor’s executives possible change to capital expenditure, it can be found in the “2018 Guidance & outlook” section of the presentation, where they announced in Figure 3.3:

Figure 3.3 Equinor's planned capital expenditure for the current year in 2018



Source: (Equinor, 2018, p. 13)

In Figure 3.3, Equinor plans a 17.02 percentage increase in capital expenditure or 1.6 billion USD from 2017 to 2018.

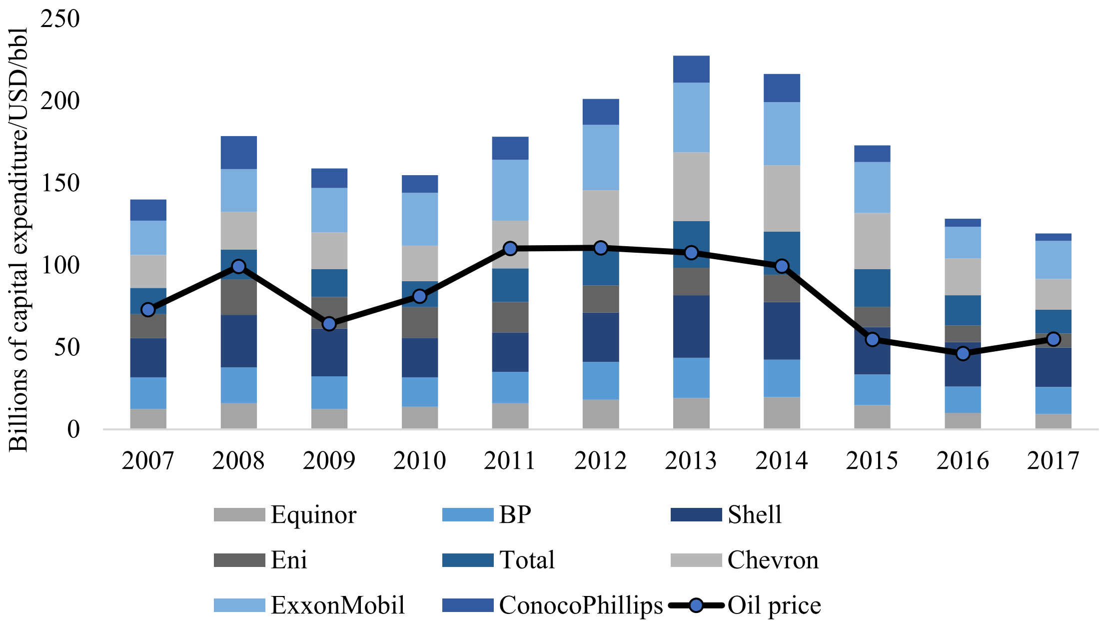
3.2 The oil and gas industry

Mohn (2008) characterizes the oil and gas industry and their investment behavior as having long investment horizons and lags, high capital intensity with cyclical investments and large indivisible investment projects and therefore illiquid capital assets. Further, the industry faces many uncertainties and risks, categorized as above and below ground risks. Where above ground risks relates to the excess and distribution of oil and gas resources. While below ground risks relates to the extraction of these resources. The oil and gas industry relies on exhaustible natural resources or reserves. Capital expenditure on exploration, replacement and development of these reserves are therefore an important aspect of the oil and gas industry, where firms must renew their reserve portfolios as time goes by. Due to exhaustible natural resources, oil and gas companies can achieve massive profits when supply decreases. The industry attracts a lot of political attention, both when political leaders allocates their countries' resources and due to climate change. Increasingly, the oil and gas industry faces new risks when establishing themselves outside the Organization for Economic Co-operation and Development (OECD) area in search for new reserves (Mohn, 2008, 2014). These countries have different institutions, customs and laws that might be potential risks for establishing firms, such as not respecting contracts and firms' property rights.

The oil and gas industry endures imperfect competition, due to the Organization of the Petroleum Exporting Countries (OPEC) (Hilyard, 2012; Mohn, 2008). OPEC presents their goals as to combine their members' market influence and therefore achieve a stable and efficient oil market for producers, consumers and investors (OPEC, 2019). In 2017, OPEC produced 39.47 million barrels of oil (bbl) per day compared to the OECD area of 24.17 million bbl per day and the total world supply of 97.40 million bbl per day (IEA, 2018b). Due to their members combined influence through their massive amounts of oil export, OPEC is able to affect the oil price and supply by altering global production output by setting members production quotas (Hilyard, 2012). The organization is not perfect however, as it is hard to control independent states oil production and there are great incentives for members to "cheat" by producing more oil than their quotas.

As assumed by Aune, Mohn, Osmundsen and Rosendahl (2010) and argued in their research, IOCs are too small on their own to have sufficient market power to alter the oil price. These firms are price-takers and maximize their profits. This should also be the case for all the eight integrated oil and gas companies included in this thesis's sample. On the other hand, OPEC is large enough to achieve market power as they coordinate their production and thus the oil price path, where their goal is to maximize their members' NPV. Aune et. al. (2010) studied IOCs changed investment behavior because of the Asian economic crisis in the late 1990s. The authors studied how these changes influenced later OPEC strategies and thus oil price paths. The Asian economic crisis was a time period characterized with an oil price decrease and IOCs responded by reducing and stabilizing their capital expenditures. The reason for the changed investment behavior was that the market used short-term accounting returns to evaluate profitability and thus discipline the IOCs and the firms' feared being below the market average. The authors' partial equilibrium model showed that reduced capital expenditure by the IOCs followed by decreased oil supply led OPEC to increase their oil price path which, caused gains in the short run. Looking at the medium run the results was mixed, the IOCs experienced losses because of their decreased investments and following lower production capacity, while they gained on the increased oil price. In the long run, IOCs and OPEC gained while oil and gas consumers and importers lost. Considering IOCs low single firm market power, the oil price increase following the Asian economic crisis was most likely not a consequence of coordinated actions between the IOCs. Rather, because of the strict short run market discipline, forcing the IOCs to act in a similar fashion at the same time, and thus enabling OPEC's strategies to increase their oil price path that would maximize their members' NPV.

Figure 3.4 Delivered capital expenditure and the oil price

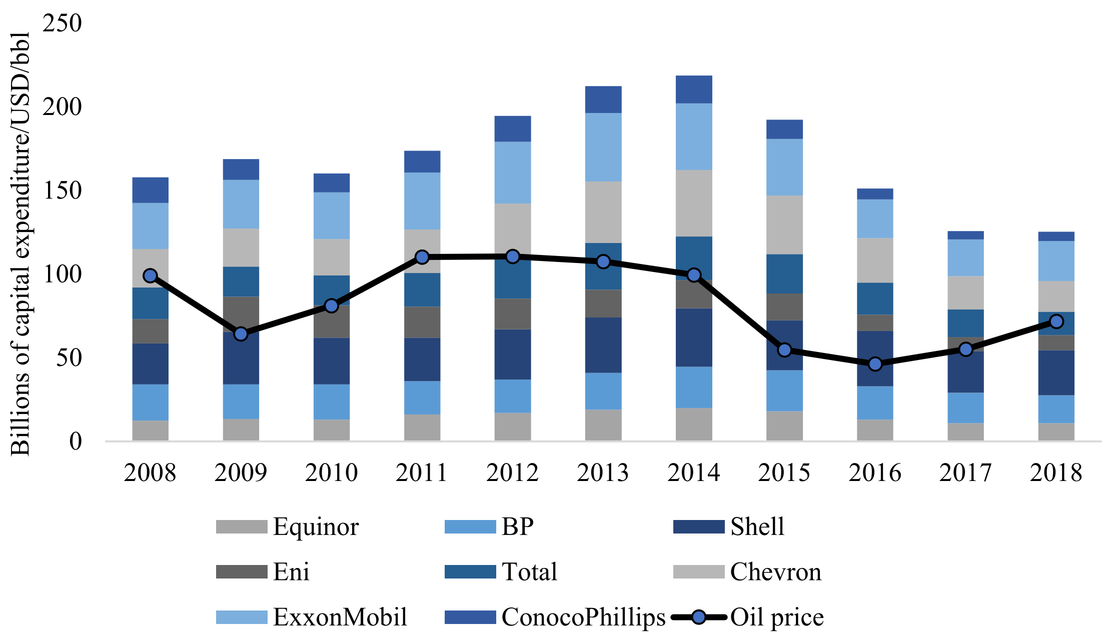


Note: Delivered capital expenditure from the eight integrated oil and gas companies in the sample, denoted in billions of USD, with the yearly average Brent Blend oil price denoted in USD per bbl.

Figure 3.4 presents the actual delivered capital expenditure and the benchmark futures oil contract Brent Blend over the chosen time period. Aggregated delivered capital expenditure has a positive correlation with the oil price Brent Blend of 0.80. Indicating that capital expenditure increases as the oil price increases, and the opposite is true with a decrease in oil price. The firms' capital expenditure moves with the oil price even though the oil price's contribution to the firms' investments systematic risks should be considered when they calculate their projects appropriate cost of capital (Bøhm & Mohn, 2017). Oil futures contracts are used as benchmarks for the spot price of oil, where Brent Blend is a combination of oils from fields in the North Sea and is used to price European, African and Middle Eastern oil sold in the West (Hilyard, 2012).

The oil price presented in Figure 3.4 is the yearly average oil price from 2007 to 2017 and is quite volatile dropping from a yearly average of 99.18 USD per bbl to 64.34 USD per bbl from 2008 to 2009, because of lower demand during the global economic recession (IEA, 2009). This caused a temporary decrease in the firms' delivered capital expenditure, illustrated in Figure 3.4. The oil price dropped again from a yearly average of 99.39 USD per bbl in 2014 to 46.26 USD per bbl in 2016. IEA (2016) described the drop in price as a consequence of the increase in US shale oil production and the following higher supply from OPEC to protect their market share. In addition, in the years before the price decline the industry had fueled higher oil supply by investing in many new projects. The resulting high supply of cheap oil increased the oil stocks in OECD countries and the demand for oil fell in the short run (IEA, 2016, p. 27). However, the oil price increased in 2016 due to organized production cuts by OPEC and some other oil producing countries (IEA, 2018a). From Figure 3.4, the firms' delivered capital expenditure peaked in 2013 but fell due to the oil price decrease in 2014 and was down to 119.35 billion USD in 2017, a fall of 47.54 percent or 108.15 billion USD over a four-year period.

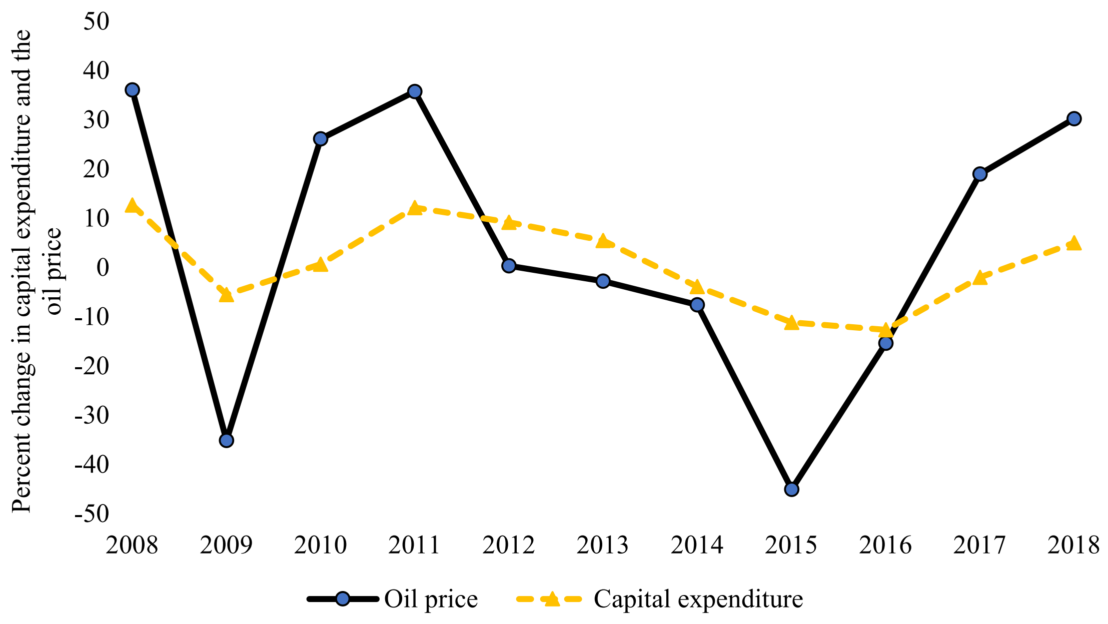
Figure 3.5 Planned capital expenditure and the oil price



Note: The announced planned capital expenditure from the eight integrated oil and gas companies in the sample, denoted in billions of USD, with the yearly average Brent Blend oil price denoted in USD per bbl.

Figure 3.5 presents the planned capital expenditure and the oil price. The global economic recession seems to have had little impact on the eight firms' capital expenditure plans. While it has fallen by 42.70 percent or 93.38 billion USD from the peak in 2014 to 2018 due to the rapid oil price decline in 2014. In the same manner as the delivered capital expenditure, the planned capital expenditure follows the oil price with a positive correlation of 0.56. The oil price used in the illustration in Figure 3.5 is the yearly average oil price from 2008 to 2018. As seen from Figure 3.1, the oil and gas production has remained quite stable over the time period while from Figure 3.4 and 3.5, the firms' investments have increased greatly up until the oil price decline in 2014. The delivered capital expenditure from 2007 to the peak in 2013 increased by 62.49 percent or 87.50 billion USD in Figure 3.4. While planned capital expenditure from 2008 to the peak in 2014 increased by 38.59 percent or 60.90 billion USD in Figure 3.5. Using the capital expenditure data contained in Figure 3.4 and 3.5 enables the calculation of the firms' announced changes in capital expenditure. From Figure 3.6 below, it is easy to observe that the changes in capital expenditure followed the changes in the oil price.

Figure 3.6 Announced capital expenditure changes and the oil price

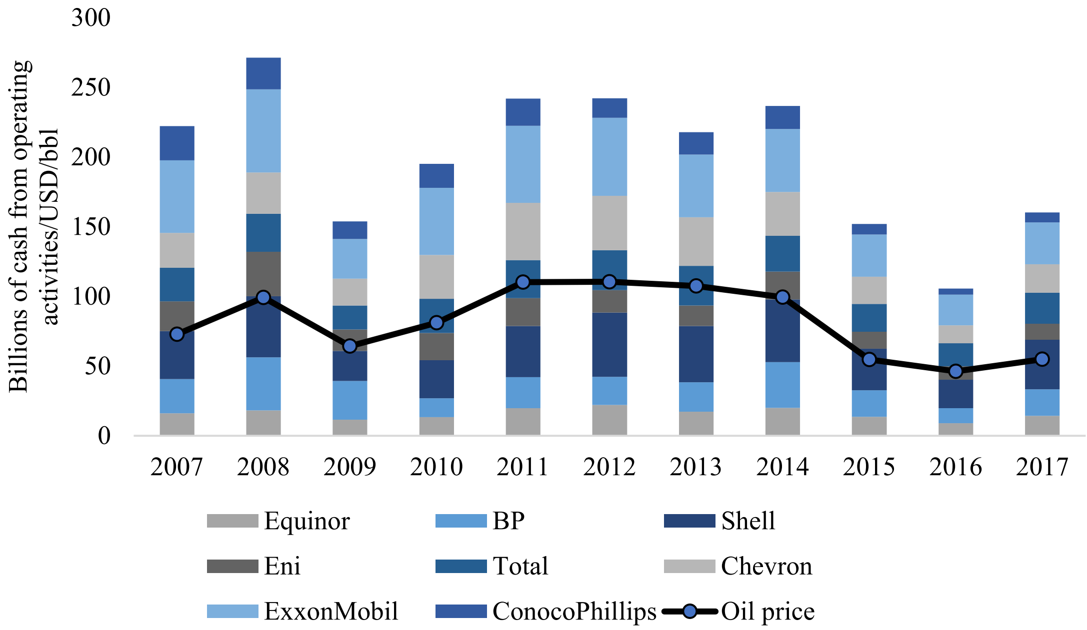


Note: Announced changes in capital expenditure denoted in percent for the sample's eight integrated oil and gas companies compared to the percentage change in the yearly average Brent Blend oil price.

As US shale oil became more viable due to new technology and high oil prices, and with the focus of the industry following the global economic recession to increase supply and replacing reserves by increasing investments and therefore costs (Bøhm & Mohn, 2017; IEA, 2016, 2018a). When the oil price fell in the autumn of 2014, the industry cut capital expenditure even though they believed the oil price decline would be temporary (Bøhm & Mohn, 2017). The decline resulted in a pressure on the industry to have strict cost discipline and stable dividends and the firms also responded by moving towards shorter, smaller, less capital intensive and more liquid projects (IEA, 2017).

This pressure was a result of shareholders raising doubts about the oil and gas industries capital expenditure plans, as previous investments reduced their profitability (Bøhm & Mohn, 2017; Mohn, 2014). Investors feared that increases in the firms' spending would finance long-term negative NPV projects, that oil and gas companies would face new political risks from climate change policies or achieve no return from risky investments outside the OECD area. Bøhm and Mohn (2017) described the situation the following way; where shareholders would punish firms for retaining dividends to finance projects, as they wanted a stable dividend policy. Considering that the industry believed in a temporary oil price decrease, managers viewed issuing new stock as expensive as it would lead to dilution. As the oil price fell the industries assets became less valuable, and selling them to gain cash was not tempting, nor was taking on too much disciplining debt and as a result, investments was cut (Bøhm & Mohn, 2017, p. 30-31). Investors rewarded these decreases in capital expenditure with increased stock prices, opposite of what neoclassical standard financial theory predicts of decreases in capital expenditure (McConnell & Muscarella, 1985; Mohn, 2015a, 2015b).

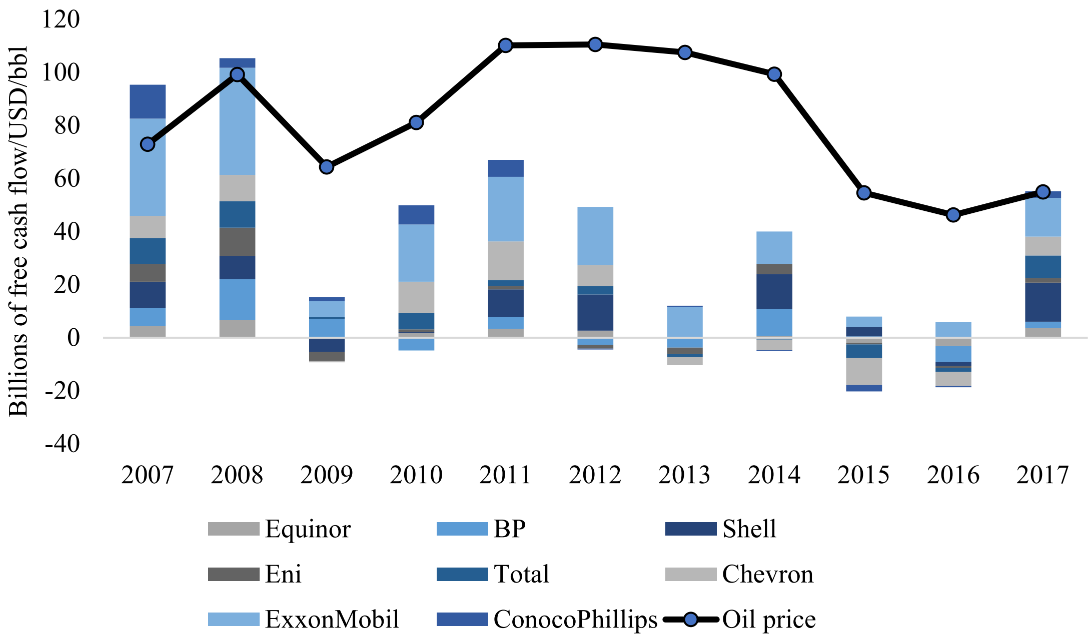
Figure 3.7 Cash from operating activities and the oil price



Note: "Cash from Operating Activities" was collected from the eight integrated oil and gas companies' "Cash Flow" using Thomson Reuters Eikon. The yearly average Brent Blend oil price is denoted in USD per bbl.

The firms experienced high cash flows and oil price in the period prior to the global economic recession. In the period between the global economic recession and the oil price decrease in 2014 shareholders had become impatient and they believed that oil and gas companies had grown too large (Mohn, 2014, 2015a). Instead, they wished firms focused on their profitability and dividend policies. From Figure 3.7, as the oil price fell the firms' cash flow fell and it became hard to keep up with the previous investment levels. IEA (2016, 2017, 2018a) described that the largest integrated oil and gas companies (BP, Eni, Total, Chevron, ExxonMobil and ConocoPhillips) predominantly used cash flow from operations to finance their projects and that these firms still chose to rely on cash flow for their investment projects following the oil price decrease in 2014. However, the firms had to take on leverage, cut investments and repurchasing of shares to be able to pay steady dividends. In 2010 to 2013, the firms mainly used cash flow to finance their projects, while they started to issue more debt in the end of 2014 and start of 2015. In the end of 2016, they went back to using internal funds such as FCF and asset sales, and started to reduce their leverage (IEA, 2016, p. 92; IEA, 2017, p. 99; IEA, 2018a, p. 131-132). The firms have potentially followed the pecking order hypothesis of financing, considering their use of internal over external financing and debt over equity when they choose their capital structures (Myers, 1984).

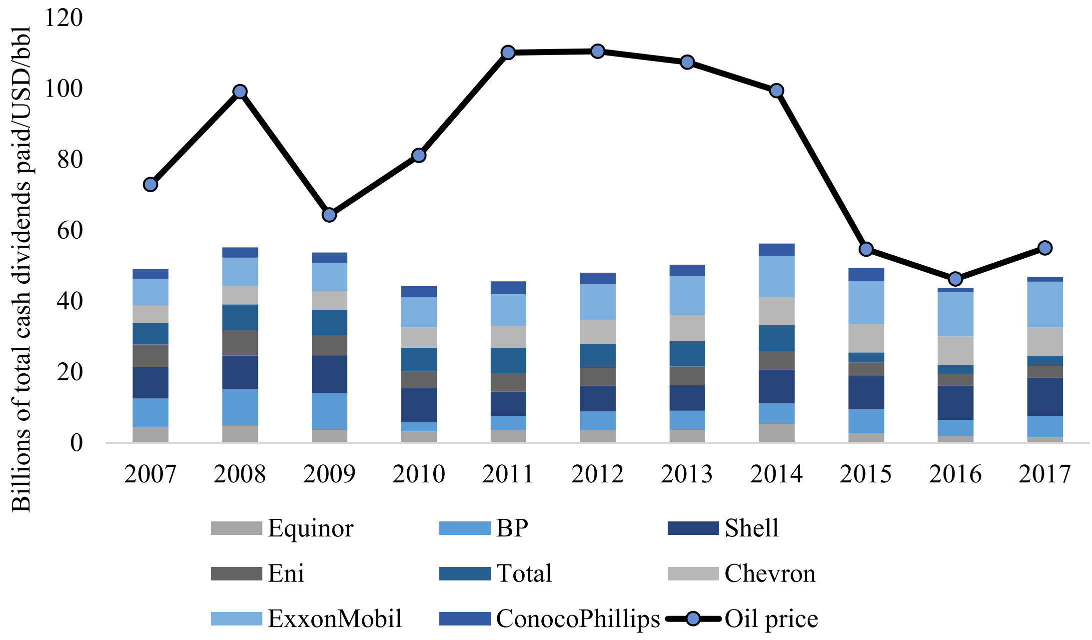
Figure 3.8 Free cash flow and the oil price



Note: “Free Cash Flow” was collected from the eight integrated oil and gas companies’ “Cash Flow” using Thomson Reuters Eikon. The yearly average Brent Blend oil price is denoted in USD per bbl.

As observed from Figure 3.8, the FCFs followed the oil price and was especially low from 2008 to 2009 due to the global economic recession. In addition, many firms experienced negative FCFs in 2015 and 2016 following the oil price decrease, only BP, Shell and ExxonMobil achieved positive FCFs in this period. FCFs was also low during 2013 when the delivered capital expenditure peaked. Indicating that the firms in the sample might have used this excess cash to finance investment projects instead of distributing the money to their shareholders through dividends or share repurchases. However, in 2017 the firms had regained their strength where all firms experienced positive FCFs again. IEA (2019) described the period after 2016 where the oil price increased and the firms have improved their efficiency and reduced their costs. These improvements allowed the firms to reduce their debt and in 2018, they started repurchasing shares again. However, they have underperformed compared to the market benchmark following the oil price decrease in 2014 (IEA, 2019, p. 129). The stable dividends policy can be observed below in Figure 3.9.

Figure 3.9 Total cash dividends paid and the oil price



Note: “Total Cash Dividends Paid” was collected from the eight integrated oil and gas companies’ “Cash Flow” using Thomson Reuters Eikon. The yearly average Brent Blend oil price is denoted in USD per bbl.

From Figure 3.9, most of the firms in the sample operated with a stable dividend policy until the oil price decline in the autumn of 2014. To be able to continue their stable dividend strategy, the firms had to take on more debt (IEA, 2016, 2017, 2018a). During the sample period, a special case occurred for BP who cut total cash dividends paid drastically in 2010 by 74.94 percent, from 10.48 billion USD in 2009 to 2.63 billion USD 2010, as dividends was suspended following the “Deepwater Horizon incident” (BP, 2011, p. 5). In addition, BP cut dividends in 2016 by 30.76 percent, from 6.66 billion USD in 2015 to 4.61 billion USD in 2016. However, BP managed to hold a relatively steady dividend policy in the sample period, except for these two incidents. Considering the other firms in the sample, Shell, Chevron and ExxonMobil also held a relatively steady dividend policy throughout the sample period, while Equinor, Eni, Total and ConocoPhillips cut dividends or remained close to status quo after the two oil price declines.

4. Econometric analysis and results

In Chapter 4, three event studies and regression analysis are conducted to estimate and test the thesis's two hypothesis. Section 4.1 presents the changes to the firms' capital expenditure and then the results from the three event studies are presented. First, the constant mean return model in Section 4.2. Second, the market-adjusted return model in Section 4.3. Third, the market model in Section 4.4. Finally, Section 4.5 applies the abnormal returns from the three event studies in the three regression analysis.

4.1 Changes to capital expenditure

Following McConnell and Muscarella's (1985) naïve model presented in Equation (2.11), of investor anticipation of capital expenditure announcements, which relies on an assumption that investors expects a continuation of the status quo. For the eight firms over the eleven years in the sample there are in total 88 events. Where there are 44 positive unexpected increases in capital expenditure, 8 announcements are status quo, while there are 36 negative unexpected decreases in capital expenditure. Following neoclassical standard financial theory with MacKinlay's (1997) categorization and McConnell and Muscarella's (1985) model: Unexpected increases in capital expenditure are denoted as Good News, status quo announcements are denoted as No News and unexpected decreases in capital expenditure are denoted as Bad News.

4.2 The constant mean return model

Following Brown and Warner's (1985) and MacKinlay's (1997) approaches in Section 4.2, the estimation windows for the three event studies are approximately one year prior to the event window and starts -250 trading days prior to the event, closing -21 trading days prior to the event day 0 to avoid overlapping of the two windows. The reason for this is to avoid that the values in the event window influence the values calculated from the estimation window. The whole event window is approximately 2 months or 41 trading days long, and starts at -20 trading days prior to the event day 0 and ends 20 trading days after the event. The reason this wide event window is used, is to account for the time the market needs to react to the capital expenditure news and look for possible information leakage to the market before the announcements (MacKinlay, 1997).

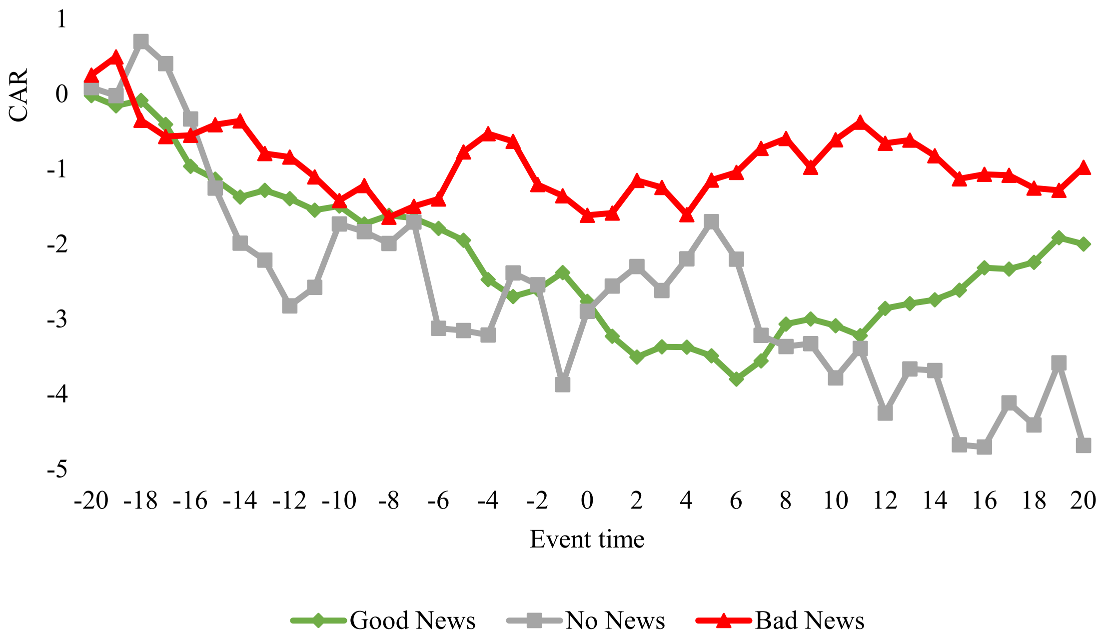
The estimation and event windows was used to calculate the stocks' actual returns using Equation (2.13). Then the firms' abnormal returns was found using Equation (2.14). Thereafter the events was converted to event time and sorted into Good, No and Bad News and the sample average abnormal returns for the types of events was calculated in the estimation and event windows using Equation (2.18). Then the average cumulative abnormal returns inside the event window was calculated using Equation (2.20) to be able to create Figure 4.1. This was done to spot any information leakage and potential slow reaction time (MacKinlay, 1997). The variance of the average abnormal returns from the estimation window was calculated using Equation (2.19), to be used as an estimator for the standard deviation of the average cumulative abnormal returns in the two-sided t-test in Equation (2.22). The values originating from the estimation window should be correctly estimated due to the sufficient length of the estimation window. Table 4.1 summarizes the results from the whole event window of 41-days. The other event windows are presented in Tables A1.1 to A1.5, found in Appendix 1. The constant mean return model.

Table 4.1 The constant mean return model's 41-days event window average abnormal returns and cumulative abnormal returns in percent

Constant mean return model $(-20, 20)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-20	-0.0205	-0.0205	0.0856	0.0856	0.2547	0.2547
-19	-0.1346	-0.1550	-0.1063	-0.0208	0.2396	0.4943
-18	0.0725	-0.0825	0.7196	0.6989	-0.8428	-0.3485
-17	-0.3208	-0.4033	-0.2934	0.4054	-0.2198	-0.5683
-16	-0.5604	-0.9637	-0.7391	-0.3337	0.0204	-0.5479
-15	-0.1695	-1.1331	-0.9196	-1.2533	0.1383	-0.4096
-14	-0.2385	-1.3717	-0.7338	-1.9871	0.0535	-0.3561
-13	0.0869	-1.2848	-0.2242	-2.2113	-0.4361	-0.7922
-12	-0.1074	-1.3922	-0.6133	-2.8246	-0.0458	-0.8380
-11	-0.1575	-1.5497	0.2508	-2.5738	-0.2655	-1.1035
-10	0.0569	-1.4927	0.8444	-1.7295	-0.3163	-1.4198
-9	-0.2395	-1.7323	-0.1059	-1.8354	0.2021	-1.2177
-8	0.1144	-1.6179	-0.1581	-1.9934	-0.4249	-1.6426
-7	-0.0374	-1.6552	0.2862	-1.7072	0.1481	-1.4945
-6	-0.1354	-1.7906	-1.4129	-3.1201	0.0963	-1.3982
-5	-0.1591	-1.9497	-0.0311	-3.1512	0.6280	-0.7701
-4	-0.5218	-2.4714	-0.0611	-3.2123	0.2420	-0.5281
-3	-0.2267	-2.6981	0.8274	-2.3849	-0.1039	-0.6320
-2	0.0910	-2.6072	-0.1578	-2.5427	-0.5739	-1.2059
-1	0.2274	-2.3798	-1.3320	-3.8747	-0.1486	-1.3546
0	-0.3854	-2.7652	0.9777	-2.8970	-0.2616	-1.6162
1	-0.4635	-3.2287	0.3390	-2.5580	0.0314	-1.5848
2	-0.2790	-3.5077	0.2601	-2.2979	0.4347	-1.1500
3	0.1399	-3.3678	-0.3221	-2.6200	-0.0930	-1.2430
4	-0.0046	-3.3724	0.4226	-2.1974	-0.3639	-1.6070
5	-0.1159	-3.4883	0.4978	-1.6996	0.4614	-1.1455
6	-0.3121	-3.8004	-0.4995	-2.1991	0.1018	-1.0437
7	0.2418	-3.5586	-1.0179	-3.2170	0.3213	-0.7224
8	0.4941	-3.0645	-0.1469	-3.3639	0.1310	-0.5914
9	0.0678	-2.9967	0.0358	-3.3281	-0.3845	-0.9760
10	-0.0895	-3.0862	-0.4568	-3.7848	0.3666	-0.6094
11	-0.1349	-3.2211	0.3933	-3.3915	0.2368	-0.3726
12	0.3641	-2.8571	-0.8618	-4.2534	-0.2836	-0.6562
13	0.0621	-2.7950	0.5917	-3.6617	0.0419	-0.6143
14	0.0537	-2.7413	-0.0252	-3.6869	-0.2097	-0.8240
15	0.1268	-2.6145	-0.9865	-4.6734	-0.3077	-1.1317
16	0.3008	-2.3137	-0.0320	-4.7054	0.0600	-1.0717
17	-0.0176	-2.3313	0.5879	-4.1175	-0.0108	-1.0825
18	0.0884	-2.2429	-0.2943	-4.4118	-0.1708	-1.2533
19	0.3299	-1.9130	0.8287	-3.5831	-0.0285	-1.2819
20	-0.0862	-1.9992	-1.0986	-4.6817	0.3067	-0.9751

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

Figure 4.1 The constant mean return model's 41-days event window average cumulative abnormal returns in percent



Note: The average cumulative abnormal returns, denoted as CAR in the figure, calculated from the eight integrated oil and gas companies' 41-days event windows. This was accomplished using stock prices from December, January, February, March and April in the sample period. Where the firms' average abnormal returns from Good, No and Bad News was calculated for each trading day and then cumulated to average cumulated abnormal returns.

Following neoclassical standard financial theory and simple expectations, the lines in Figure 4.1 should be going the following ways on the announcement day: The Good News line is expected to increase on the event day, while the No News line is expected to remain flat and the Bad News line is expected to decrease on the event day (MacKinlay, 1997; McConnell & Muscarella, 1985). First, considering the Good News line in Figure 4.1, there is an immediate negative reaction on the announcement day. There also seems to be possible information leakage to the market six days before the announcement, as there is a steeper downward trend, while seven days following the event, the Good News line seems to improve with an upward trend (MacKinlay, 1997). Second, considering the No News line, there is a steep positive reaction on the announcement day and a positive trend, which lasts five days after the announcement. There is also two big drops one and six days before the announcements possibly indicating information leakage to the market. The drop approximately one week prior to the event seems to affect all the lines as they move at the same time. Finally, considering the Bad

News line, there is a small negative reaction on the announcement day, with a positive reaction two days following the event. This indicates that the market is possibly slower to react to Bad News as they might take time to process the new information. There also seems to be possible information leakage with a positive reaction five days before the event day.

To see if the eight integrated oil and gas companies in the sample experience statistically significant abnormal return responses, several event windows has been chosen for testing as seen from Table 4.2 below. Further, following MacKinlay (1997), the event day and the day following the event day has been chosen, as announcements might have occurred after the stock market had closed. A 4-days event window is chosen as it might capture information leakage just before the announcement and late reactions after the announcement. In addition, wider event windows of 11-days, 21-days and 41-days has been chosen to gain insight into what has happened in the period before and after the announcement. Note that it is important to consider that the announcements does not only include capital expenditure news and the simple expectations are naïve, especially the expectation that the No News line remains flat on the announcement day. In addition, possible information leakages and late reactions can be other news about the firms prior to and after their planned announcements. For example, ExxonMobil tend to announce capital expenditure at their analyst meetings, the observed responses might be reactions to other news regarding the companies presented at the same time as the capital expenditure plans.

Table 4.2 The constant mean return model's two-sided t-test of the chosen event windows' average cumulative abnormal returns

The constant mean return model's two-sided t-test			
	Good News	No News	Bad News
$\overline{CAR}(0,0)$	-0.3854	0.9777	-0.2616
$var(\overline{CAR}(0,0))^{1/2}$	0.2600	0.8050	0.3464
θ_1	-1.4823	1.2145	-0.7553
$p-value$	0.1455	0.2639	0.4551
$\overline{CAR}(0,1)$	-0.8489	1.3167	-0.2302
$var(\overline{CAR}(0,1))^{1/2}$	0.2600	0.8050	0.3464
θ_1	-3.2647	1.6356	-0.6646
$p-value$	0.0022	0.1459	0.5106
$\overline{CAR}(-2,1)$	-0.5306	-0.1731	-0.9528
$var(\overline{CAR}(-2,1))^{1/2}$	0.2600	0.8050	0.3464
θ_1	-2.0405	-0.2150	-2.7506
$p-value$	0.0475	0.8359	0.0094
$\overline{CAR}(-5,5)$	-1.6978	1.4205	0.2526
$var(\overline{CAR}(-5,5))^{1/2}$	0.2600	0.8050	0.3464
θ_1	-6.5291	1.7646	0.7293
$p-value$	0.0000	0.1210	0.4707
$\overline{CAR}(-10,10)$	-1.5366	-1.2110	0.4941
$var(\overline{CAR}(-10,10))^{1/2}$	0.2600	0.8050	0.3464
θ_1	-5.9092	-1.5043	1.4265
$p-value$	0.0000	0.1762	0.1626
$\overline{CAR}(-20,20)$	-1.9992	-4.6817	-0.9751
$var(\overline{CAR}(-20,20))^{1/2}$	0.2600	0.8050	0.3464
θ_1	-7.6884	-5.8156	-2.8152
$p-value$	0.0000	0.0007	0.0080
n	44	8	36

Note: The percentage average cumulative abnormal returns for the firms' Good, No and Bad News (n). With variance from the average abnormal returns in the estimation window using the constant mean return model. The p-values was calculated using the command "2*pt(-abs(t),df)" in R.

In Table 4.2 the sample's average abnormal return, or average cumulative abnormal return response on the announcement day of Good, No and Bad News is tested at the 5 percent level with the two-sided t-tests from Equation (2.22). The event studies are used to test the thesis's first hypothesis, where the first null hypothesis (H_0^1) states that, the news presented on the event days have no effect on the behavior of the firms' stock prices. Against the first alternative hypothesis (H_A^1) which states that, the news presented on the event days have an effect. For all types of announcements on the event day in the constant mean return model, H_0^1 is not rejected in favor of H_A^1 at the 5 percent level, that the news presented on the event day have an effect on the behavior of the firms' stock prices.

Using Equation (2.19) to obtain an estimator for the variance of the average cumulative abnormal returns in the multi-day intervals of choice. Equation (2.22) can be used to test the statistically significance of the average cumulative abnormal return response in wider event windows. First, from Table 4.2 with wider event windows there are generally statistically significant negative responses to Good News where the firms experience negative average cumulative abnormal return responses in the 2-days to 41-days event windows, ranging from -0.85 to -2.00 percent. Second, for No News there is a statistically significant negative average cumulative abnormal return response in the 41-days event window of -4.68 percent. Finally, for Bad News, the firms experience two statistically significant negative average cumulative abnormal return responses for the 4-days event window of -0.95 percent and in the 41-days event window of -0.98 percent. In all these cases with statistically significant responses, H_0^1 is rejected in favor of H_A^1 at the 5 percent level, that the news presented on the event days have an effect on the behavior of the firms' stock prices. In general, the firms in the sample experience statistically significant negative average cumulative abnormal return responses in the 41-days event windows when they present Good, No and Bad News.

4.3 The market-adjusted return model

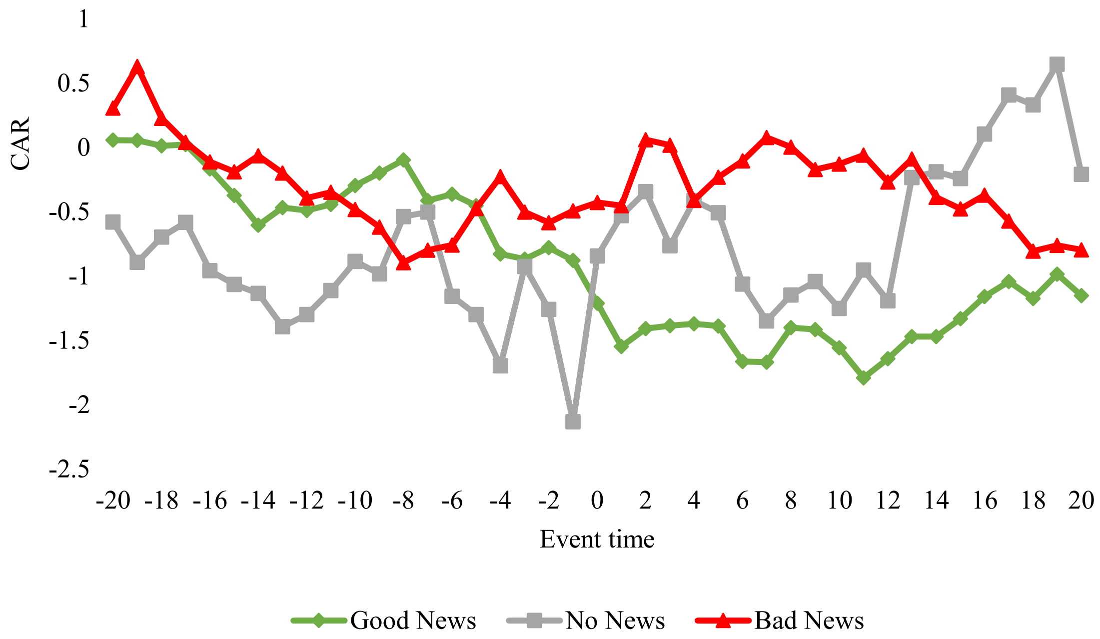
The market-adjusted return model approach is quite useful when considering small event windows of up to one month after the event date (Dimson & Marsh, 1986). However, concluding with statistically significance must be taken with a grain of salt, due to possible biased abnormal returns. Therefore, the market-adjusted return model should be used with the other models to see if the events have other than normal effects on the firms' stock prices. Following Brown and Warner's (1985), Dimson and Marsh's (1986) and MacKinlay's (1997) approaches in Section 4.3, the estimation and event windows was used to calculate the stocks' and Dow Jones U.S. Oil & Gas Titans 30 Index's actual returns using Equation (2.13). Then the firms' abnormal returns was found using Equation (2.15). Following this, the event study was conducted the same way as the constant mean return model in Section 4.2. Table 4.3 summarizes the results from the whole event window of 41-days. The other event windows are presented in Tables A2.1 to A2.5, found in Appendix 2. The market-adjusted return model.

Table 4.3 The market-adjusted return model's 41-days event window average abnormal returns and cumulative abnormal returns in percent

Market-adjusted return model $(-20, 20)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-20	0.0578	0.0578	-0.5777	-0.5777	0.3082	0.3082
-19	-0.0008	0.0570	-0.3135	-0.8912	0.3227	0.6309
-18	-0.0431	0.0140	0.1959	-0.6953	-0.4033	0.2276
-17	0.0093	0.0232	0.1154	-0.5799	-0.1862	0.0413
-16	-0.1872	-0.1640	-0.3775	-0.9574	-0.1528	-0.1115
-15	-0.2077	-0.3717	-0.1057	-1.0631	-0.0763	-0.1878
-14	-0.2308	-0.6025	-0.0696	-1.1326	0.1236	-0.0643
-13	0.1363	-0.4662	-0.2588	-1.3915	-0.1341	-0.1983
-12	-0.0237	-0.4899	0.0938	-1.2977	-0.1945	-0.3928
-11	0.0487	-0.4411	0.1878	-1.1098	0.0454	-0.3474
-10	0.1465	-0.2947	0.2260	-0.8838	-0.1339	-0.4813
-9	0.0984	-0.1963	-0.0964	-0.9803	-0.1356	-0.6169
-8	0.1005	-0.0957	0.4445	-0.5357	-0.2765	-0.8933
-7	-0.3147	-0.4105	0.0350	-0.5007	0.0963	-0.7970
-6	0.0490	-0.3615	-0.6554	-1.1561	0.0385	-0.7585
-5	-0.0895	-0.4510	-0.1413	-1.2974	0.2840	-0.4745
-4	-0.3755	-0.8265	-0.3981	-1.6955	0.2503	-0.2241
-3	-0.0403	-0.8667	0.7709	-0.9246	-0.2775	-0.5017
-2	0.0882	-0.7785	-0.3324	-1.2570	-0.0815	-0.5832
-1	-0.0972	-0.8757	-0.8736	-2.1305	0.0919	-0.4913
0	-0.3338	-1.2096	1.2894	-0.8411	0.0661	-0.4252
1	-0.3369	-1.5465	0.3127	-0.5284	-0.0249	-0.4501
2	0.1407	-1.4058	0.1857	-0.3427	0.5121	0.0620
3	0.0204	-1.3854	-0.4198	-0.7625	-0.0435	0.0184
4	0.0167	-1.3687	0.3500	-0.4125	-0.4281	-0.4096
5	-0.0176	-1.3863	-0.0929	-0.5054	0.1800	-0.2296
6	-0.2780	-1.6643	-0.5565	-1.0619	0.1264	-0.1032
7	-0.0041	-1.6683	-0.2843	-1.3462	0.1832	0.0800
8	0.2694	-1.3989	0.1994	-1.1467	-0.0769	0.0030
9	-0.0156	-1.4145	0.1044	-1.0423	-0.1722	-0.1691
10	-0.1413	-1.5558	-0.2075	-1.2498	0.0402	-0.1289
11	-0.2336	-1.7894	0.2977	-0.9521	0.0715	-0.0574
12	0.1488	-1.6407	-0.2395	-1.1916	-0.2089	-0.2663
13	0.1713	-1.4694	0.9590	-0.2326	0.1773	-0.0890
14	-0.0010	-1.4704	0.0446	-0.1880	-0.2973	-0.3863
15	0.1405	-1.3298	-0.0528	-0.2408	-0.0904	-0.4767
16	0.1709	-1.1589	0.3466	0.1058	0.1079	-0.3687
17	0.1190	-1.0400	0.3042	0.4101	-0.2008	-0.5696
18	-0.1321	-1.1720	-0.0780	0.3320	-0.2344	-0.8040
19	0.1870	-0.9851	0.3178	0.6498	0.0442	-0.7598
20	-0.1660	-1.1511	-0.8562	-0.2064	-0.0359	-0.7957

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

Figure 4.2 The market-adjusted return model's 41-days event window average cumulative abnormal returns in percent



Note: The average cumulative abnormal returns, denoted as CAR in the figure, calculated from the eight integrated oil and gas companies' 41-days event windows. This was accomplished using stock and benchmark prices from December, January, February, March and April in the sample period. Where the firms' average abnormal returns from Good, No and Bad News was calculated for each trading day and then cumulated to average cumulated abnormal returns.

First, the Good News line in Figure 4.2 behaves much like the line in Figure 4.1. There is an immediate negative reaction on the announcement day and again there is possible information leakage four to seven days before the announcement (MacKinlay, 1997). With steep decreases in average cumulative abnormal returns, the market might have known parts of the news on the announcement day. 12 days following the event, the Good News line seems to improve again with an upward trend. Second, considering the No News line, there is a steep increase on the event day, which continues for two days following the event. There is a negative response one day before the announcement, indicating that there is possible information leakage to the market. This can also be observed as long as six days before the event day. Finally, considering the Bad News line, there is a small positive close to flat reaction on the announcement day followed by a steep positive reaction two days following the event. This is further evidence that the market is possibly slower to react to Bad News. There also seems to be a positive trend starting five days prior to the announcement. Comparing Figure 4.2 to Figure 4.1, the No News line increases and the Bad News line decreases approximately two weeks following the event.

Table 4.4 The market-adjusted return model's two-sided t-test of the chosen event windows' average cumulative abnormal returns

The market-adjusted return model's two-sided t-test			
	Good News	No News	Bad News
$\overline{CAR}(0,0)$	-0.3338	1.2894	0.0661
$var(\overline{CAR}(0,0))^{1/2}$	0.1459	0.4021	0.1755
θ_1	-2.2881	3.2070	0.3767
$p-value$	0.0271	0.0149	0.7087
$\overline{CAR}(0,1)$	-0.6707	1.6022	0.0412
$var(\overline{CAR}(0,1))^{1/2}$	0.1459	0.4021	0.1755
θ_1	-4.5971	3.9848	0.2349
$p-value$	0.0000	0.0053	0.8156
$\overline{CAR}(-2,1)$	-0.6797	0.3962	0.0516
$var(\overline{CAR}(-2,1))^{1/2}$	0.1459	0.4021	0.1755
θ_1	-4.6588	0.9855	0.2939
$p-value$	0.0000	0.3572	0.7705
$\overline{CAR}(-5,5)$	-1.0247	0.6507	0.5289
$var(\overline{CAR}(-5,5))^{1/2}$	0.1459	0.4021	0.1755
θ_1	-7.0234	1.6185	3.0141
$p-value$	0.0000	0.1496	0.0048
$\overline{CAR}(-10,10)$	-1.1147	-0.1400	0.2184
$var(\overline{CAR}(-10,10))^{1/2}$	0.1459	0.4021	0.1755
θ_1	-7.6398	-0.3482	1.2448
$p-value$	0.0000	0.7379	0.2215
$\overline{CAR}(-20,20)$	-1.1511	-0.2064	-0.7957
$var(\overline{CAR}(-20,20))^{1/2}$	0.1459	0.4021	0.1755
θ_1	-7.8895	-0.5134	-4.5344
$p-value$	0.0000	0.6235	0.0001
n	44	8	36

Note: The percentage average cumulative abnormal returns for the firms' Good, No and Bad News (n). With variance from the average abnormal returns in the estimation window using the market-adjusted return model. The p-values was calculated using the command "2*pt(-abs(t),df)" in R.

First, from Table 4.4, firms announcing Good News experience statistically significant negative average cumulative abnormal return responses in the 1-day until 41-days event windows, ranging from -0.33 to -1.15 percent. Second, firms announcing No News experience statistically significant positive average cumulative abnormal return responses in the 1-day and 2-days event windows, ranging from 1.29 to 1.60 percent. Finally, for firms announcing Bad News experience mixed statistically significant average cumulative abnormal return responses. For 11-days event window, they experience a positive average cumulative abnormal return response of 0.53 percent, while for the 41-days event window, they experience a negative average cumulative abnormal return response of -0.80 percent. In all the statistically significant cases above, H_0^1 is rejected in favor of H_A^1 at the 5 percent level, that the news presented on the event days have an effect on the behavior of the firms' stock prices.

Comparing the results from Table 4.4 to the constant mean return model in Table 4.2. There are statistically significant responses on the event day, where Good and No News are significant at the 5 percent level. Worth mentioning is that No News in the 41-days event window is no longer statistically significant in the market-adjusted return model. In addition, the standard deviations have dropped quite a bit in the market-adjusted return model compared to the constant mean return model.

4.4 The market model

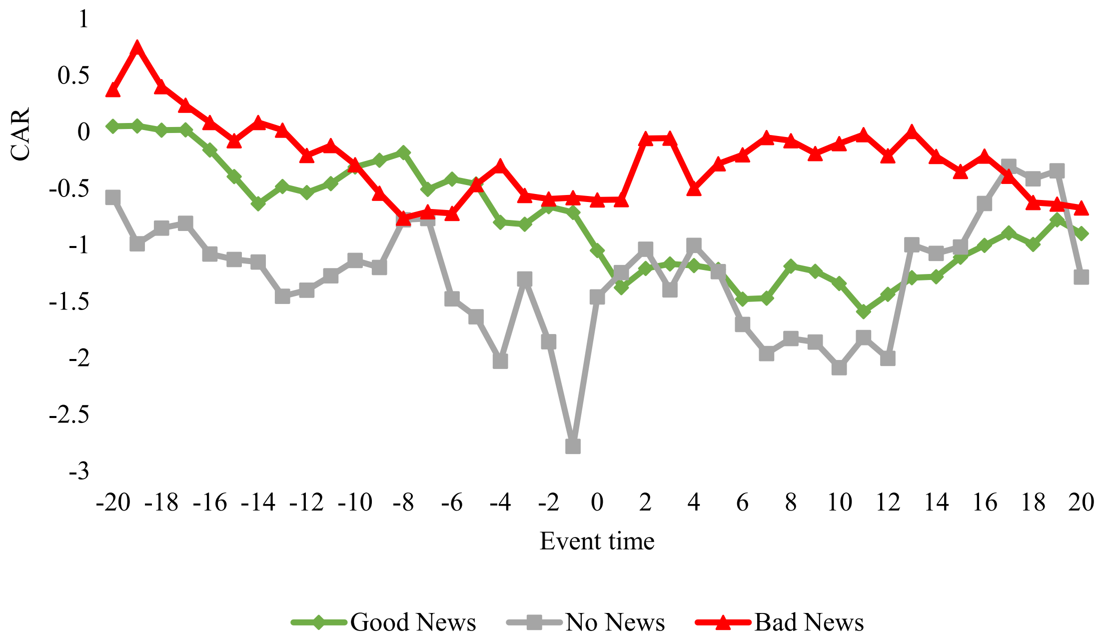
Following MacKinlay's (1997) approach in Section 4.4, the estimation and event windows was used to calculate the stocks' and Dow Jones U.S. Oil & Gas Titans 30 Index's actual returns using Equation (2.13). Thereafter the firms' abnormal returns was found using Equation (2.17) by estimating $(\widehat{\alpha}_i)$ and $(\widehat{\beta}_i)$. These parameters should be correctly estimated due to the sufficient length of the estimation window. Then the event study was conducted the same way as the constant mean return model and the market-adjusted return model in Section 4.2 and 4.3 respectively. Table 4.5 summarizes the results from the whole event window of 41-days. The other event windows are presented in Tables A3.1 to A3.5, found in Appendix 3. The market model.

Table 4.5 The market model's 41-days event window average abnormal returns and cumulative abnormal returns in percent

Market model $(-20, 20)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-20	0.0500	0.0500	-0.5769	-0.5769	0.3750	0.3750
-19	0.0047	0.0547	-0.4117	-0.9886	0.3771	0.7522
-18	-0.0384	0.0164	0.1398	-0.8487	-0.3502	0.4020
-17	0.0032	0.0196	0.0426	-0.8062	-0.1633	0.2386
-16	-0.1795	-0.1599	-0.2738	-1.0800	-0.1553	0.0833
-15	-0.2345	-0.3945	-0.0471	-1.1271	-0.1600	-0.0767
-14	-0.2404	-0.6349	-0.0225	-1.1496	0.1604	0.0838
-13	0.1527	-0.4821	-0.3029	-1.4525	-0.0681	0.0156
-12	-0.0544	-0.5365	0.0524	-1.4000	-0.2217	-0.2061
-11	0.0810	-0.4555	0.1293	-1.2707	0.0867	-0.1194
-10	0.1465	-0.3090	0.1332	-1.1375	-0.1696	-0.2890
-9	0.0592	-0.2498	-0.0600	-1.1976	-0.2522	-0.5412
-8	0.0675	-0.1823	0.4210	-0.7766	-0.2198	-0.7610
-7	-0.3254	-0.5077	0.0108	-0.7657	0.0552	-0.7058
-6	0.0917	-0.4160	-0.7112	-1.4770	-0.0134	-0.7192
-5	-0.0431	-0.4591	-0.1568	-1.6337	0.2535	-0.4657
-4	-0.3392	-0.7983	-0.3939	-2.0276	0.1685	-0.2973
-3	-0.0192	-0.8174	0.7264	-1.3012	-0.2645	-0.5618
-2	0.1557	-0.6617	-0.5544	-1.8556	-0.0317	-0.5935
-1	-0.0488	-0.7105	-0.9251	-2.7807	0.0118	-0.5817
0	-0.3374	-1.0479	1.3228	-1.4579	-0.0203	-0.6020
1	-0.3279	-1.3758	0.2142	-1.2437	0.0036	-0.5984
2	0.1679	-1.2078	0.2069	-1.0369	0.5417	-0.0567
3	0.0399	-1.1679	-0.3609	-1.3978	0.0020	-0.0547
4	-0.0145	-1.1825	0.3955	-1.0022	-0.4437	-0.4984
5	-0.0322	-1.2147	-0.2320	-1.2343	0.2188	-0.2796
6	-0.2641	-1.4788	-0.4692	-1.7035	0.0781	-0.2015
7	0.0087	-1.4700	-0.2576	-1.9611	0.1517	-0.0498
8	0.2817	-1.1883	0.1335	-1.8276	-0.0282	-0.0780
9	-0.0453	-1.2336	-0.0302	-1.8577	-0.1116	-0.1895
10	-0.1051	-1.3387	-0.2280	-2.0858	0.0872	-0.1023
11	-0.2496	-1.5883	0.2665	-1.8193	0.0792	-0.0230
12	0.1532	-1.4351	-0.1829	-2.0022	-0.1863	-0.2094
13	0.1464	-1.2886	1.0047	-0.9975	0.2134	0.0040
14	0.0087	-1.2799	-0.0770	-1.0745	-0.2201	-0.2161
15	0.1717	-1.1082	0.0565	-1.0181	-0.1314	-0.3475
16	0.1044	-1.0038	0.3859	-0.6321	0.1341	-0.2134
17	0.1118	-0.8920	0.3291	-0.3030	-0.1766	-0.3899
18	-0.1018	-0.9938	-0.1107	-0.4137	-0.2344	-0.6243
19	0.2183	-0.7755	0.0712	-0.3425	-0.0128	-0.6371
20	-0.1223	-0.8978	-0.9404	-1.2829	-0.0336	-0.6707

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad news.

Figure 4.3 The market model's 41-days event window average cumulative abnormal returns in percent



Note: The average cumulative abnormal returns, denoted as CAR in the figure, calculated from the eight integrated oil and gas companies' 41-days event windows. This was accomplished using stock and benchmark prices from December, January, February, March and April in the sample period. Where the firms' average abnormal returns from Good, No and Bad News was calculated for each trading day and then cumulated to average cumulated abnormal returns.

First, Figure 4.3 is similar to Figure 4.2, and the Good News line still behaves much like the line in Figure 4.1. There is an immediate negative reaction on the announcement day and six days following the event, and there is a negative reaction four days before the event day. While, there is a positive trend 12 days following the announcement. Second, for the No News line there is an immediate positive reaction on the announcement day. There is still two big drops one and six days before the event, indicating that there is still possible information leakage to the market (MacKinlay, 1997). Following the announcement there is a steep increase in average cumulative abnormal returns and the No News line is still climbing following the event as in Figure 4.2. Finally, for the Bad News line, there is a flat reaction on the announcement day, while there is a positive reaction two days following the event day. Providing further evidence that the market is possibly slower to react to Bad News and takes time to process the new information before deciding on an appropriate response. There is a positive trend four days prior to the Bad News announcements and a decrease four days following the event day. The

Good and Bad News lines in Figure 4.3 are similar to the lines in Figure 4.1 and 4.2 after the event. In contrast, the No News line now follows the Good News line after the event.

Table 4.6 The market model's two-sided t-test of the chosen event windows' average cumulative abnormal returns

The market model's two-sided t-test			
	Good News	No News	Bad News
$\overline{CAR}(0,0)$	-0.3374	1.3228	-0.0203
$var(\overline{CAR}(0,0))^{1/2}$	0.1436	0.3972	0.1720
θ_1	-2.3491	3.3306	-0.1180
$p-value$	0.0235	0.0126	0.9067
$\overline{CAR}(0,1)$	-0.6653	1.5369	-0.0167
$var(\overline{CAR}(0,1))^{1/2}$	0.1436	0.3972	0.1720
θ_1	-4.6320	3.8699	-0.0971
$p-value$	0.0000	0.0061	0.9232
$\overline{CAR}(-2,1)$	-0.5583	0.0575	-0.0366
$var(\overline{CAR}(-2,1))^{1/2}$	0.1436	0.3972	0.1720
θ_1	-3.8872	0.1448	-0.2128
$p-value$	0.0003	0.8890	0.8327
$\overline{CAR}(-5,5)$	-0.7987	0.2427	0.4396
$var(\overline{CAR}(-5,5))^{1/2}$	0.1436	0.3972	0.1720
θ_1	-5.5607	0.6110	2.5550
$p-value$	0.0000	0.5605	0.0151
$\overline{CAR}(-10,10)$	-0.8832	-0.8150	0.0171
$var(\overline{CAR}(-10,10))^{1/2}$	0.1436	0.3972	0.1720
θ_1	-6.1490	-2.0522	0.0992
$p-value$	0.0000	0.0793	0.9216
$\overline{CAR}(-20,20)$	-0.8978	-1.2829	-0.6707
$var(\overline{CAR}(-20,20))^{1/2}$	0.1436	0.3972	0.1720
θ_1	-6.2506	-3.2302	-3.8985
$p-value$	0.0000	0.0144	0.0004
n	44	8	36

Note: The percentage average cumulative abnormal returns for the firms' Good, No and Bad News (n). With variance from the average abnormal returns in the estimation window using the market model. The p-values was calculated using the command "2*pt(-abs(t),df)" in R.

First, from Table 4.6, firms announcing Good News experience statistically significant negative average cumulative abnormal return responses in the 1-day until 41-days event windows, ranging from -0.34 to -0.90 percent. Second, firms announcing No News experience mixed statistically significant average cumulative abnormal return responses. In the 1-day and 2-days event windows, they experience statistically significant positive average cumulative abnormal return responses ranging from 1.32 to 1.54 percent. While they experience a statistically significant negative average cumulative abnormal return response in the 41-days event window of -1.28 percent. Finally, for firms announcing Bad News, they also experience mixed statistically significant average cumulative abnormal return responses. For 11-days event window, they experience a positive average cumulative abnormal return response of 0.44 percent, while for the 41-days event window, they experience a negative average cumulative abnormal return response of -0.67 percent. In all the statistically significant cases above, H_0^1 is rejected in favor of H_A^1 at the 5 percent level, that the news presented on the event days have an effect on the behavior of the firms' stock prices.

From Table 4.6, comparing the results to the constant mean return model in Table 4.2 and the market-adjusted return model in Table 4.4. The standard deviation has decreased again when applying the market model compared to the market-adjusted return model, and dropped substantially compared to the constant mean return model. This is due to the market model reducing abnormal return variance (MacKinlay, 1997).

First, with the 1-day and 2-days event windows in the market model, Good and No News are significant at the 5 percent level, just like in the market-adjusted return model. Firms experience statistically significant negative average cumulative abnormal return responses with Good News while the opposite occurs with No News. Second, considering the 4-days event window, only Good News is statistically significant in the market model and the market-adjusted return model. This is not the case for the constant mean return model, which also found statistically significant negative average cumulative abnormal return response for Bad News. Third, just as in the market-adjusted return model, the market model finds that firms experience a statistically significant positive average cumulative abnormal return response for the 11-days event window when they announce Bad News. In addition, the opposite occurs for Good News in all models. A possible reason for the positive responses is potentially due to the model capturing the slow positive reactions to the Bad News following the announcements, as seen in Figure 4.1, 4.2 and 4.3 (MacKinlay, 1997). In addition, possible information leakages before the announcements. However, these reactions could be due to other news about the firms. Finally, for the 41-days event window, the market model concludes the same way as the constant mean return model. Where firms announcing Good, No and Bad News all experience statistically significant negative average cumulative abnormal return responses.

4.5 The regression analysis

The three different ways of calculating abnormal returns creates three possible regressions analysis to see if the changes in capital expenditures result in systematic stock price responses at the 5 percent level, starting with Equation (2.23). Then the analysis is improved by adding additional independent variables in Equation (2.24) and (2.26). Such as the dummy variables ($Supermajor$), (GSE), (US) and (EU). All these dummy variables are equal to one if they are a supermajor, GSE, US or EU firm and zero otherwise, they are also applied in separate models due to high correlations. In addition, the independent variables for oil and gas production ($Production$) and proved reserves ($Reserves$) of oil and natural gas liquids (NGL) are applied. Finally, following Mohn and Osmundsen (2011) the analysis have been expanded to include asymmetric dynamics, with ΔI^{+} and ΔI^{-} in Equation (2.26). Note that several other independent variables have been applied in the regression analysis. However, none of them was statistically significant at the 5 percent level and was not added to the tables below. In addition, simpler models with few independent variables gave the best results in the analysis.

First, the supermajor and GSE dummy variables were added to see if the stock market responds any differently to these types of firms, where 66 out of 88 observations are supermajors, as BP, Shell, Total, Chevron, ExxonMobil and ConocoPhillips are defined as the supermajors (Hilyard, 2012). While, 22 out of 88 observations are GSEs, as Equinor and Eni are GSEs. Second, the US and EU dummy variables were added to see if the stock market responds any differently to firms from different regions, where 33 out of 88 observations are American firms and all of them are supermajors. While, 55 out of 88 observations are European firms. Third, the independent variables for production and proved reserves were added to see how the stock market responds to the firms' production and reserves. Using Thomson Reuters Eikon, the oil and gas production and the proved reserves of oil and NGL are collected from the eight integrated oil and gas companies' "Operating Metrics". While, Equinor's and Eni's proved reserves in the fiscal year 2014 have been collected from their annual reports.

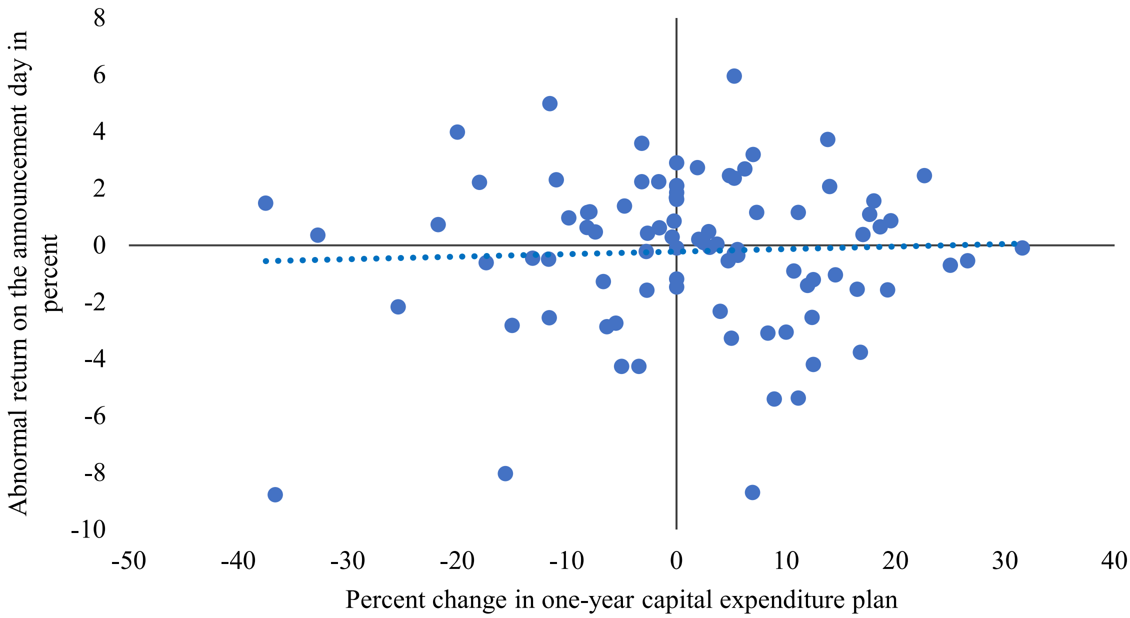
To test for heteroscedasticity the Breusch-Pagan test and the White test are applied (Breusch & Pagan, 1979; White, 1980). Where the tests' null hypothesis (H_0^H) states that, ε_τ is homoscedastic, while the tests' alternative hypothesis (H_A^H) states that, ε_τ is heteroscedastic. Breusch and Pagan (1979) argues that with heteroscedasticity, OLS will lose efficiency and the estimated coefficients' standard errors are biased which could lead to wrong inferences of the tests' results. Following Mohn and Osmundsen (2011), if Model i (M_i) and Asymmetric model j (AM_j) show evidence of heteroscedasticity, robust standard errors are applied. This is done to ensure that the inferences from the tests are correct (White, 1980).

Table 4.7 The constant mean return model's regression analysis

	Constant mean return model				
	M_1	M_2	M_3	M_4	M_5
α	-0.0022	0.0097	-0.0062	0.0211	0.0101
	(0.4679)	(0.0932)	(0.0634)	(0.0205)	(0.1777)
ΔI	0.0089	0.0125	0.0125	0.0202	0.0103
	(0.7454)	(0.5643)	(0.5643)	(0.3573)	(0.7077)
$Supermajor$		-0.0159			
		(0.0181)			
GSE			0.0159		
			(0.0181)		
$Production$				-0.0055	
				(0.0073)	
$Reserves$					-0.0019
					(0.0447)
N	88	88	88	88	88
R^2	0.0019	0.0658	0.0658	0.0835	0.0486
Breusch-Pagan:	**				
χ^2	5.2500	2.0900	2.0900	0.7400	1.3800
$p-value$	0.0220	0.1481	0.1481	0.3892	0.2407
White:					**
χ^2	4.5300	6.5900	6.5900	10.3300	11.4300
$p-value$	0.1040	0.1592	0.1592	0.0665	0.0435

Note: The estimated coefficients' p-values are presented in the parentheses and (M_i) denotes Model i. Both heteroscedasticity tests was run in Stata, using the command "estat hettest" for the Breusch-Pagan test, while using the command "estat imtest, white" for the White test. Robust standard errors was applied to models that had evidence of heteroscedasticity at the 5 percent level denoted with ** in the table, using the command "vce(robust)" in Stata.

Figure 4.4 The constant mean return model's regression analysis Model 1



Note: The abnormal return responses on the announcement days when the firms announced changes in capital expenditure plans in Model 1 (M_1).

Table 4.7 applies the abnormal returns from the constant mean return model. The three regression analysis are used to test the thesis's second hypothesis, where the second null hypothesis (H_0^2) states that, the capital expenditure news have no effect on the behavior of the firms' stock prices. While the second alternative hypothesis (H_A^2) states that, the capital expenditure news have an effect on the behavior of the firms' stock prices. As seen from Model 1 and all the other models in Table 4.7, H_0^2 is not rejected in favor of H_A^2 at the 5 percent level, that the capital expenditure announcements have an effect on the behavior of the firms' stock prices. In addition, the Breusch-Pagan and White tests show evidence of heteroscedasticity in Model 1 and Model 5, where H_0^H is rejected in favor of H_A^H at the 5 percent level, and robust standard errors are applied. Model 1 has a low coefficient of determination at 0.19 percent, where Figure 4.4 considers all the 88 capital expenditure announcements and abnormal return responses and it is easy to observe that they are quite spread out.

Additional independent variables have been added to improve the analysis. First, by adding $Supermajor$ in Model 2, increases the coefficient of determination drastically to 6.58 percent. If the firm is a supermajor, they experience a statistically significant negative abnormal (daily) return response of -1.59 percent. Second, by adding GSE in Model 3 results in the same coefficient of determination as Model 2 and, if the firm is a GSE, they experience a statistically significant positive abnormal (daily) return response of 1.59 percent, exactly opposite of the supermajors in Model 2. Third, by adding $Production$ in Model 4, increases the coefficient of determination further to 8.35 percent. If the firms increase production by 1 mmboe, they experience a statistically significant negative abnormal (daily) return response of -0.55 percent. Finally, by adding $Reserves$ in Model 5, yields a coefficient of determination of 4.86 percent and if the firms increase proved reserves by 1 billion barrels, they experience a statistically significant negative abnormal (daily) return response of -0.19 percent.

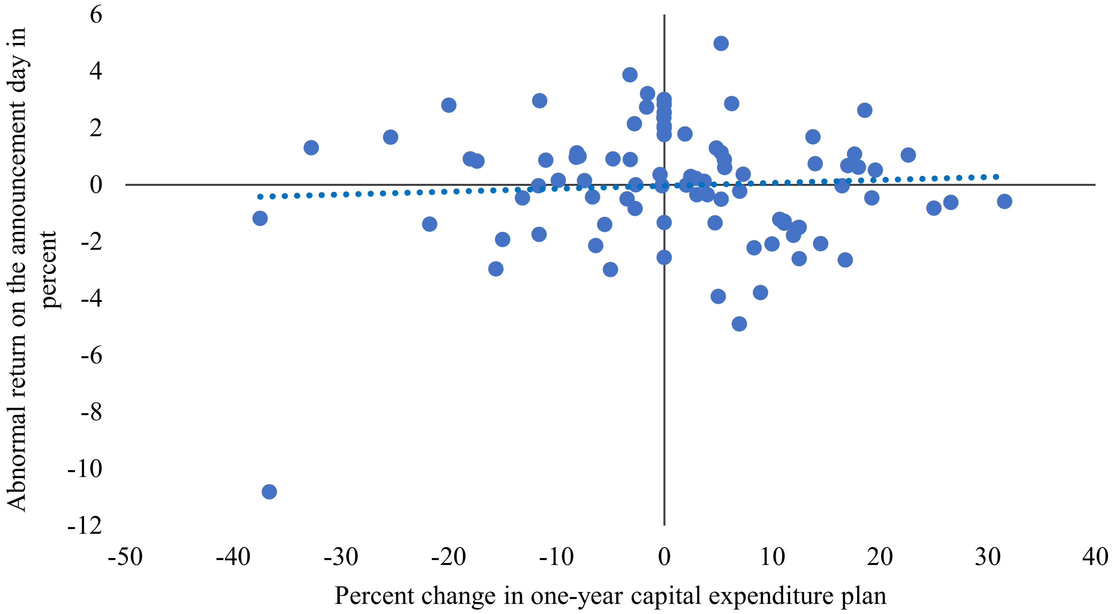
Interpreting the results above reveals interesting insights, the stock market potentially requires more from the supermajors than the GSEs, or perhaps the GSEs have performed better than the supermajors in the sample period. However, the stock market is not pleased with the firms as they respond negatively to their production and proved reserves.

Table 4.8 The market-adjusted return model's regression analysis

Market-adjusted return model				
	M_6	M_7	M_8	M_9
α	-0.0003	0.0109	-0.0041	0.0169
	(0.8919)	(0.0269)	(0.1470)	(0.0324)
ΔI	0.0102	0.0137	0.0137	0.0186
	(0.7212)	(0.6300)	(0.6300)	(0.5215)
$Supermajor$		-0.0150		
		(0.0096)		
GSE			0.0150	
			(0.0096)	
$Production$				-0.0041
				(0.0102)
N	88	88	88	88
R^2	0.0038	0.0921	0.0921	0.0729
Breusch-Pagan:	**			
χ^2	23.4100	0.5500	0.5500	0.4100
$p-value$	0.0000	0.4586	0.4856	0.5207
White:	**	**	**	**
χ^2	15.2200	18.3600	18.3600	19.5400
$p-value$	0.0005	0.0010	0.0010	0.0015

Note: The estimated coefficients' p-values are presented in the parentheses and (M_i) denotes Model i. Both heteroscedasticity tests was run in Stata, using the command "estat hettest" for the Breusch-Pagan test, while using the command "estat imtest, white" for the White test. Robust standard errors was applied to models that had evidence of heteroscedasticity at the 5 percent level denoted with ** in the table, using the command "vce(robust)" in Stata.

Figure 4.5 The market-adjusted return model's regression analysis Model 6



Note: The abnormal return responses on the announcement days when the firms announced changes in capital expenditure plans in Model 6 (M_6).

Table 4.8 applies the abnormal returns from the market-adjusted return model. However, as seen from Model 6 and all the other models in Table 4.8, H_0^2 is not rejected in favor of H_A^2 at the 5 percent level, also the Breusch-Pagan and White tests show evidence of heteroscedasticity. Note that Model 6's coefficient of determination at 0.38 percent is still low but has improved compared to Model 1. Figure 4.5 considers all the 88 capital expenditure announcements and abnormal return responses and comparing them to Figure 4.4, they are not as spread out.

First, adding $Supermajor$ in Model 7, increases the coefficient of determination further to 9.21 percent compared to Model 2. Now, if the firm is a supermajor, they experience a statistically significant negative abnormal (daily) return response of -1.50 percent. Second, adding GSE in Model 8, results in the same coefficient of determination as Model 7. If the firm is a GSE, they experience a statistically significant positive abnormal (daily) return response of 1.50 percent, exactly opposite of Model 7. Finally, adding $Production$ in Model 9, decreases the coefficient of determination to 7.29 percent compared to Model 4. If the firms increase production by 1 mmboe, this produces a statistically significant negative abnormal (daily) return response of -0.41 percent.

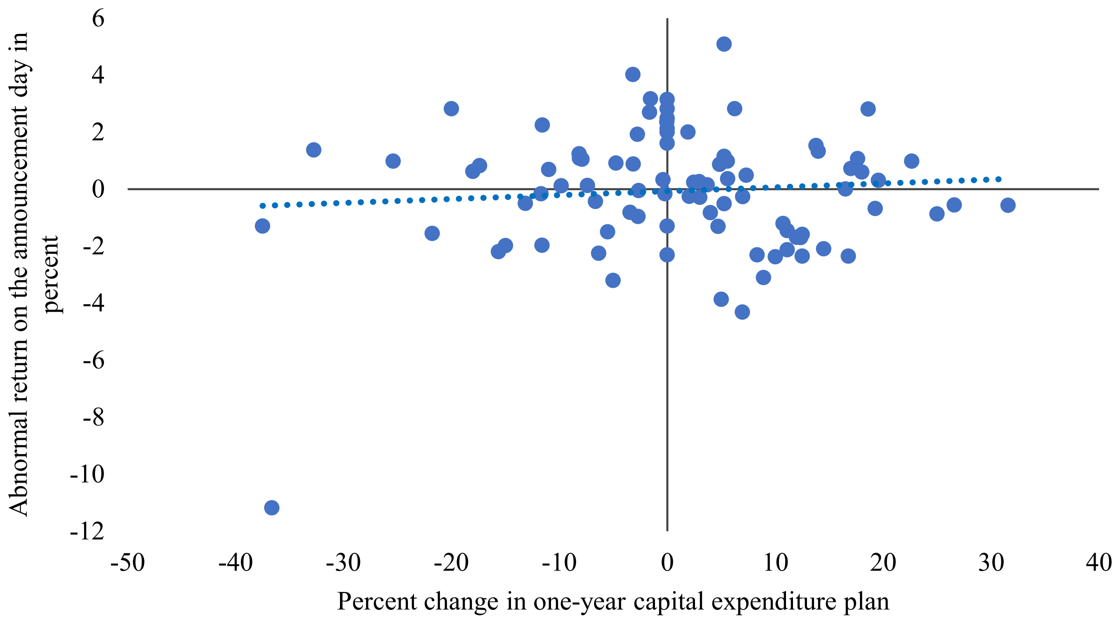
The market-adjusted return model's regression analysis in Table 4.8 confirms most of the results from the constant mean return model's regression analysis in Table 4.7. Where it seems the market potentially requires more from the supermajors compared to the GSEs, or perhaps the GSEs have performed better than the supermajors in the sample period. In addition, the market responds negatively to the firms' production levels.

Table 4.9 The market model's regression analysis

	Market model								
	M_{10}	M_{11}	M_{12}	M_{13}	M_{14}	M_{15}	M_{16}	AM_1	AM_2
α	-0.0007	0.0114	-0.0048	0.0176	0.0094	0.0031	-0.0069	0.0132	0.0235
	(0.7739)	(0.0139)	(0.0945)	(0.0255)	(0.0829)	(0.2821)	(0.0804)	(0.0872)	(0.0102)
ΔI	0.0137	0.0174	0.0174	0.0225	0.0148	0.0106	0.0106		
	(0.6383)	(0.5443)	(0.5443)	(0.4413)	(0.6183)	(0.7009)	(0.7009)		
ΔI^+								-0.0166*	-0.0166*
								(0.0490)	(0.0448)
ΔI^-								-0.0134	-0.0140
								(0.1158)	(0.0960)
$Supermajor$		-0.0162							
		(0.0037)							
GSE			0.0162						
			(0.0037)						
$Production$				-0.0043					
				(0.0059)					
$Reserves$					-0.0016				-0.0015
					(0.0226)				(0.0374)
US						-0.0100			
						(0.0298)			
EU							0.0100		
							(0.0298)		
N	88	88	88	88	88	88	88	88	88
R^2	0.0069	0.1101	0.1101	0.0853	0.0565	0.0559	0.0559	0.0450	0.0933
Breusch-Pagan:	**								
χ^2	25.0000	2.0500	2.0500	0.1400	0.9500	3.3200	3.2300	0.0700	1.2700
$p-value$	0.0000	0.1518	0.1518	0.7102	0.3289	0.0722	0.0722	0.7958	0.2600
White:	**	**	**	**	**	**	**		
χ^2	15.6000	19.1400	19.1400	20.1100	17.8100	17.3400	17.3400	1.0500	1.7700
$p-value$	0.0004	0.0007	0.0007	0.0012	0.0032	0.0017	0.0017	0.5908	0.9392

Note: The estimated coefficients' p-values are presented in the parentheses and * denotes that H_0^2 is rejected at the 5 percent level. In addition, (M_i) denotes Model i and (AM_j) denotes Asymmetric model j. Both heteroscedasticity tests was run in Stata, using the command "estat hettest" for the Breusch-Pagan test, while using the command "estat imtest, white" for the White test. Robust standard errors was applied to models that had evidence of heteroscedasticity at the 5 percent level denoted with ** in the table, using the command "vce(robust)" in Stata.

Figure 4.6 The market model's regression analysis Model 10



Note: The abnormal return responses on the announcement days when the firms announced changes in capital expenditure plans in Model 10 (M_{10}).

Table 4.9 applies the abnormal returns from the market model and in Model 10 to Model 16, H_0^2 is not rejected in favor of H_A^2 at the 5 percent level. In addition, the Breusch-Pagan and White tests show evidence of heteroscedasticity for these models. Model 10's coefficient of determination has improved further to 0.69 percent with the market model as it reduces abnormal return variance (MacKinlay, 1997). This can be observed from Figure 4.6, which considers all the 88 capital expenditure announcements and abnormal return responses. As the observations are not as spread out compared to Figure 4.4 and 4.5.

First, adding $Supermajor$ in Model 11, increases the coefficient of determination further to 11.01 percent compared to Model 2 and 7. If the firm is a supermajor, they experience a statistically significant negative abnormal (daily) return response of -1.62 percent. Second, adding GSE in Model 12, results in the same coefficient of determination as Model 11. However, if the firm is a GSE, they experience a statistically significant positive abnormal (daily) return response of 1.62 percent, exactly opposite of Model 11.

Third, adding $Production$ in Model 13, increases the coefficient of determination further to 8.53 percent compared to Model 4 and 9. If the firms increase production by 1 mmboe, this produces a statistically significant negative abnormal (daily) return response of -0.43 percent. Fourth, adding $Reserves$ in Model 14, yields a coefficient of determination of 5.65 percent, which is higher than Model 5. If the firms increase proved reserves by 1 billion barrels, this produces a statistically significant negative abnormal (daily) return response of -0.16 percent.

Fifth, adding US in Model 15, lowers the coefficient of determination to 5.59 percent compared to the Model 2, 7 and 11 that includes $Supermajor$. If the firm is American, they experience a statistically significant negative abnormal (daily) return response of -1.00 percent. Sixth, adding EU in Model 16, results in the same coefficient of determination as Model 15. However, if the firm is European, they experience a statistically significant positive abnormal (daily) return response of 1 percent, exactly opposite of Model 15.

Seven, there are 44 observations of Good News and 36 observations of Bad News in the sample out of 88 observations. Following Mohn and Osmundsen (2011), asymmetric dynamics are applied to the capital expenditure changes by adding ΔI^+ and ΔI^- in Asymmetric model 1. If the firms announce Good News of an increase in capital expenditure, they experience a statistically significant negative abnormal (daily) return response of -1.66 percent. However, the estimated coefficient for ΔI^- is not statistically significant. The coefficient of determination in Asymmetric model 1 has improved to 4.50 percent, much higher than in symmetric Model 1, 6 and 10. Finally, adding ΔI^+, ΔI^- and $Reserves$ in Asymmetric model 2. If the firms announce Good News of an increase in capital expenditure, they experience a statistically significant negative abnormal (daily) return response of -1.66 percent. However, the estimated coefficient for ΔI^- is still not statistically significant. If the firms increase proved reserves by 1 billion barrels, this produces a statistically significant negative abnormal (daily) return response of -0.15 percent. The coefficient of determination has improved to 9.33 percent, which is higher than Model 5 and 14.

For Asymmetric model 1 and 2, H_0^2 is rejected in favor of H_A^2 at the 5 percent level, that the capital expenditure announcements have an effect on the behavior of the firms' stock prices. In addition, considering the asymmetric hypothesis presented in Section 2.4.4, H_0^{AD} is rejected in favor of H_A^{AD} at the 5 percent level, the market responds asymmetrically to increases in capital expenditure with a negative direction, while the direction for decreases capital expenditure is uncertain due to higher p-values.

Note, that there is a high negative correlation of -0.83 between ΔI^{+} and ΔI^{-}. Asymmetric model l and 2 are checked for multicollinearity using the command "estat vif" in Stata, where both ΔI^{+} and ΔI^{-} had variance inflation factors ($VIFs$) of 3.25 in Asymmetric model 1 and 2 (O'Brien, 2007). With $VIFs$ lower than the common rules of thumb of 4 and 10, multicollinearity should not be too much of a concern. In addition, increases in capital expenditure seems robust in the two asymmetric models as the standard errors barely move in Asymmetric model 1 to 2, from 0.0083 to 0.0081 respectively, also, the p-values are quite similar, 0.049 and 0.045 respectively. Considering the response to Good News in the event studies and the robustness of the dummy variable for increased capital expenditure, the results seems appropriate.

Asymmetric model 1 and 2 shows that when the firms in the sample announce increases in capital expenditure, the market responds in a negative direction with negative abnormal (daily) return responses. In addition as seen from the three regression analysis, it seems the stock market potentially requires more from the supermajors and American firms compared to the GSEs and European firms, or perhaps the GSEs and European firms have performed better than the supermajors and American firms in the sample period. However, the stock market is not pleased with the integrated oil and gas companies' production and proved reserves. Potentially the increases in capital expenditure lead to lower than preferred increases in production and proved reserves during the sample period.

5. Discussion

First, the stock market responds negatively to Good News in most models where the firms in the sample experience statistically significant negative average cumulative abnormal return responses ranging from -0.33 to -2.00 percent in the different event windows. Second, Asymmetric model 1 and 2 confirms that firms announcing an increase in capital expenditure experience a statistically significant negative abnormal (daily) return response of -1.66 percent. The event studies confirms that the news presented on the event days have an effect on the behavior of the firms' stock prices. While the regression analysis confirms that, the capital expenditure announcements, specifically increases in capital expenditure, have an effect on the behavior of the firms' stock prices. Chapter 5 will therefore focus on the results from Chapter 4 related to the stock market's responses to increases in capital expenditure, in the light of the theory and literature presented in Chapter 2 and the historical retrospect from Chapter 3. Where Section 5.1 addresses the stock market's responses in accordance with neoclassical standard financial theory, while Section 5.2 applies behavioral corporate finance theory.

5.1 Rational overinvestment and moral hazard

5.1.1 Neoclassic standard financial theory

The results from the event studies and regression analysis seems to have reversed the expectations from neoclassical standard financial theory when considering capital expenditure increases. As McConnell and Muscarella (1985) argues in their article, the market should react positively to increased capital expenditure as it signals an increase in future positive NPV projects. Comparing this thesis's results to McConnell and Muscarella's (1985) cross-sectional mean model with a 2-days event window there are some similarities. In the authors' model, when the oil and gas companies increased capital expenditure their announcement period return decreased by -0.55 percent, while the comparison period mean return experienced an increase of 0.28 percent. The authors described that this stock market response indicates that the firms have overinvested in negative NPV projects. In this thesis, in the 2-days event window where the firms announced increased capital expenditure lead to statistically significant negative average cumulative abnormal return responses ranging between -0.67 and -0.85 percent in the different models.

5.1.2 The NPV decision rule

Graham and Harvey (2001) found that CFOs of large firms mostly use the NPV or IRR rules when making investment decisions. The eight integrated oil and gas companies in the sample are some of the largest oil and gas producers in the world. However, this does not confirm that the firms in the sample use or apply the appropriate NPV decisions rule. Especially, considering that Krüger et. al. (2015) found evidence for the "WACC fallacy" in their sample. Consequently, it seems reasonable that not all investors are reassured. The "WACC fallacy" is especially disastrous for oil and gas companies as their investment horizon is long and therefore small changes in the discount rate could potentially lead to huge project valuation errors. Considering that increases in capital expenditure was meet with negative responses it might signal that the rational market knew that managers deviated from the NPV decision rule.

5.1.3 Free cash flow theory

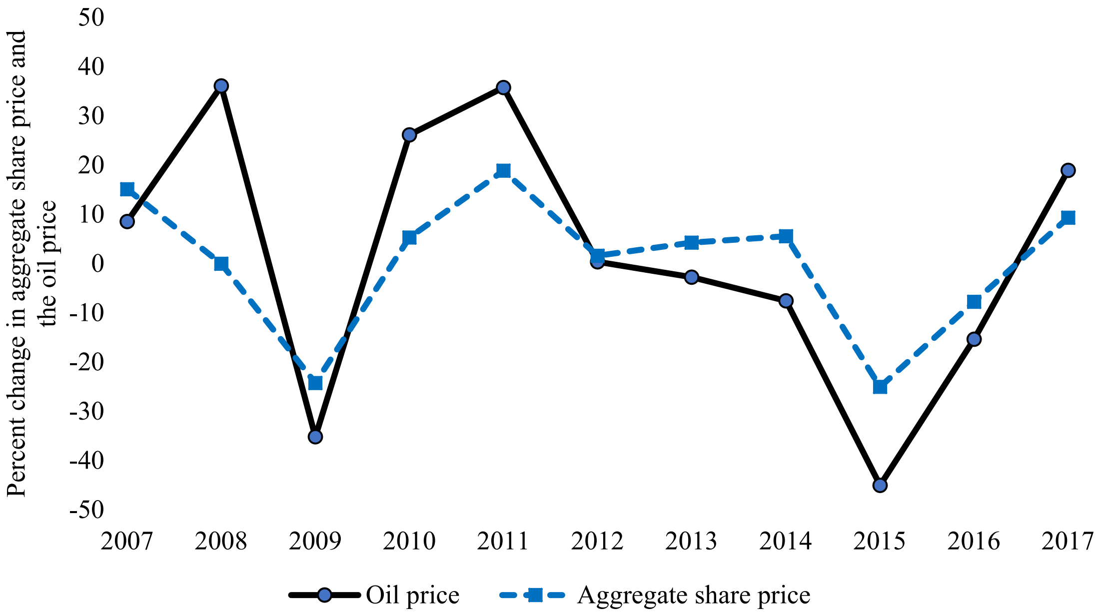
As mentioned in Section 3.2, the largest integrated oil and gas companies predominantly used cash flow from operations to finance their projects in the sample period and that these firms still chose to rely on cash flow for their investment projects following the oil price decrease in 2014 (IEA, 2016, 2017, 2018a). In addition, as Jensen (1986) presents, the oil and gas industry have had issues relating to empire building and other negative NPV investments in the 1970s and 1980s. With free cash flow theory, access to great amounts of FCF increases managers' power and could be a leading issue in periods with high oil price as seen from Figure 3.8, and the following increased capital expenditure as seen from Figure 3.4, 3.5 and 3.6. Increased FCF and managerial power could potentially have caused negative NPV investments, and the stock market responded negatively. Considering that with great amounts of FCF, rational managers can build empires for themselves and in addition potentially obtain a respectable executive compensation, maximizing their utility. As mentioned in Section 2.5.2, Harford (1999) finds support for Jensen's (1986) free cash flow theory, with evidence that firms with abundant FCF and resulting reduced monitoring, was more likely to acquire another company in value-destroying bids.

5.1.4 The optimal compensation contract

Rational managers might have used excessive amounts of FCF to finance their projects as their compensation contracts potentially was out of balance (Hall & Liebman, 1998; Jensen, 1986).

Managers are assumed to maximize their own and shareholders' welfare when given an optimal compensation contract as their wealth is sufficiently tied together (Hall & Murphy, 2000, 2002).

Figure 5.1 The firms' aggregated yearly average share price and the oil price



Note: The percentage change in the firms' aggregated yearly average share prices and the Brent Blend oil price from 2007 to 2017, collected using Thomson Reuters Eikon.

As argued by Hall and Liebman (1998) in Section 2.2, the optimal compensation contract is one where the manager's pay is equal to the firm's value, selling the firm to the manager, however, this is most likely not appropriate for large firms. In addition, when there is high volatility the contracts could potentially be out of balance reducing managerial incentives. As seen from Figure 3.4, 3.5 and 3.6, most of the increases in capital expenditure by the integrated oil and gas companies in the sample follows the increase in oil price. Due to the two rapid oil and stock price declines and following increases as seen in Figure 5.1, the executives' compensation contracts might have been misaligned due to high volatility in the sample period. This could have caused agency problems and costs, as managers' and shareholders' interests was not sufficiently tied together. Considering the results from the event studies and the asymmetric models, the news of increases in capital expenditure might have been interpreted by the market as spending on negative NPV projects as they knew that the contracts was misaligned, providing poor managerial incentives due to high volatility.

5.1.5 Asymmetric information

Managers should trade-off between debt and equity and choose the optimal capital structure that maximize the net benefits of debt and their firms' values (Jensen, 1986; Korteweg, 2010). As mentioned previously in Section 3.2, during the sample period, managers was forced to take on debt, cut investments and repurchasing of shares to be able to pay steady dividends, however, managers was not tempted to use too much disciplining debt (Bøhm & Mohn, 2017; IEA, 2016, 2017, 2018a). In addition, the firms relied on cash flow from operations to finance their projects and they still chose to rely on cash flow following the oil price decrease in 2014 (IEA, 2016, 2017, 2018a). As argued by M. Harris and Raviv (1990) in Section 2.5.2, debt is a useful tool to signal to the market the state of the firm and the quality of the managers. Without the optimal amount of disciplining debt, it could have made it difficult to signal that the managers' new projects had a positive impact on the firms' values. Causing shareholders to pressure the firms towards an optimal capital structure. A possible explanation could be that there was a lack of compensation when managers attempted incentive-signalling due to the oil and share price volatility, as seen from Figure 5.1 (Hall & Liebman, 1998; Ross, 1977). The amount of disciplining debt managers already had chosen might have maximized the executives' compensation contracts while still being too low to signal the true value of the new projects. Consequently, the market had no way of confirming that the signal provided by the managers was true and responded by lowering their share prices.

5.1.6 Adverse selection

Investors might have believed that with volatile oil and share prices and following uncertain growth prospects for the industry, that investing in oil and gas companies' stocks was a bad investment due to adverse selection (Akerlof, 1970; Leland & Pyle, 1977). If managers did not invest in their firms' stocks, then investors lacked a credible signal of the integrated oil and gas companies' types when they announced Good News. Investors might have believed that good investment opportunities had been pushed out of the market and there were only "lemons" left that wanted to finance poor projects with new equity issues. The market required a discount to buy these stocks reducing the firms' stock prices and the managers' opportunities to issue new equity.

5.1.7 The pecking order hypothesis of financing

It seems the firms in the sample might have followed the pecking order hypothesis of financing, where internal financing is preferred over external financing, and debt is preferred over equity (Myers, 1984). Asymmetric information problems related to the equity issues presented above in Section 5.1.6, potentially lead executives to prefer internal financing and debt. As seen from Figure 3.7 and 3.8, the sample's eight integrated oil and gas companies had time periods of high cash flows and FCFs until the oil price declines, which have been used to ease financing (IEA, 2016, 2017, 2018a). Considering that the largest integrated oil and gas companies predominantly used cash flow from operations to finance their projects in the sample period, and favored debt over equity. The irrelevance of capital structure proposed by Modigliani and Miller (1958) does not seem to apply to the sample's eight integrated oil and gas companies. In addition, considering the firms' steady dividend policy which can be observed in Figure 3.9, the irrelevance of dividend payments proposed by M. H. Miller and Modigliani (1961) also does not seem to apply to these firms, as dividends seems more desirable than retained earnings for shareholders.

5.1.8 Reducing rational overinvestment

Considering the industry's history, the market conditions and the firms' capital structure where internal financing was predominately used (IEA, 2016, 2017, 2018a; Jensen, 1986; McConnell & Muscarella, 1985). The most likely explanation for the stock market's negative responses to increases in capital expenditure are due to abundant free cash flow and increased managerial power (Jensen, 1986; McConnell & Muscarella, 1985). Strengthening the issue, managers' compensation contracts were potentially misaligned in the sample period (Hall & Liebman, 1998; Hall & Murphy, 2000, 2002). Within Jensen's (1986) free cash flow theory, debt reduces FCF available for managerial rational overinvestment and the associated agency costs. The reason for this is that debt can be used to repurchase shares, which enables a trustworthy promise from managers to shareholders that they will receive their FCFs at a future date and acts as a substitute for dividends. In addition, debt enables monitoring which incentivizes managers, increasing the firms' efficiency and values. As mentioned in Section 2.5.2, M. Harris and Raviv (1990) expands on Jensen's (1986) idea and argues, that debt gives shareholders incentive to pressure managers to choose the optimal capital structure with the amount of disciplining debt that allows for proper monitoring and maximizes the firms' values.

Considering debt as a tool to reduce overinvestment, D'Mello and Miranda (2010) confirms that disciplining debt reduces rational CEOs' overinvestment.

5.2 Irrational overinvestment and overconfidence

5.2.1 Overconfidence

People tend to be overconfident and this thesis has presented researchers' evidence that this is the case (Odean, 1998). Restating some of the research from Section 2.5.3 to aid the discussion: Malmendier and Tate (2015) updated their 2005 and 2008 articles and found that 40 percent of the CEOs in their sample was overconfident in the form of overoptimism with the option-based approach. In addition, they argued that overconfident CEOs would only overinvest when their firms' had sufficient internal funds and had the possibility of obtaining correctly valued risk-free debt. Ferris et. al. (2013) confirmed Malmendier and Tate's (2008) work with a global perspective. While, Ben-David et. al. (2013) found that only 36 percent of CFOs in their sample hit within their 80 percent confidence intervals on forecast intervals of the S&P 500. This provided evidence that the average CFO in their sample was miscalibrated. Graham et. al. (2013) found that CEOs in their sample was generally more optimistic than the population including CFOs, in addition CEOs are more risk-tolerant then the general population. They found that 80.2 percent of their sample's CEOs was very optimistic using the survey-based approach. Finally, Goel and Thakor (2008) argues that it is more likely for an overconfident manager to become CEO as they win intrafirm tournaments.

Behavioral corporate finance literature provides evidence that not all managers are fully rational as assumed by neoclassical standard financial theory. Even though this thesis does not provide evidence that the sample's eight integrated oil and gas companies' executives are biased. The topic can still be discussed by borrowing from relevant academic literature and discussing the managers' decisions and the market's responses within behavioral corporate finance theory. As argued earlier in Section 2.3 and 2.5.3, considering that overconfident executives win intrafirm tournaments to become CEOs and their tasks are generally complex, unique and they thus receive little feedback to learn from their mistakes, it is possible that overconfidence is common among managers (Goel & Thakor, 2008; D. Hirshleifer, 2001).

5.2.2 The biased managers perspective

Interpreting the negative responses to capital expenditure increases within the biased managers perspective, the rational market potentially viewed executives as being overconfident. Rational investors was not pleased that biased managers was spending more of their hard-earned money on unnecessary perceived positive NPV projects that in reality was negative NPV projects (Baker & Wurgler, 2013; Malmendier & Tate, 2008; Malmendier, 2018). The stock market's negative responses can potentially be explained by the two components of overconfidence, overoptimism and miscalibration (Malmendier, 2018).

5.2.3 Overoptimism

First, overoptimism seems as a likely issue because of a long period of increasing oil prices, optimism and availability of cash within the industry. Considering the oil price decrease in 2014, the investors' industry interest fell, while managers was still optimistic as they viewed the decline as a temporary setback (Bøhm & Mohn, 2017). In the period following up to this oil price decline, managers might have been overoptimistic about the valuations of mean returns in their industry, firms and investment projects (Ben-David et al., 2013; Malmendier, 2018).

Following Baker and Wurgler's (2013) model in Section 2.3, overoptimistic managers might have perceived it as expensive to issue new stocks due to dilution and relied on the pecking order hypothesis of financing. If managers' overoptimism is too large and they have sufficient cash and debt, then managers will not issue enough new equity to offset their overoptimism when financing investment projects. The managers will rely on the pecking order hypothesis of financing and irrationally overinvest in negative NPV projects. This seems probable, considering that the firms still chose to rely on cash flow for their investment projects following the oil price decrease in 2014 (IEA, 2016, 2017, 2018a). In addition, Heaton (2002) explains that managers will invest in negative NPV projects that they believe are positive NPV when they have abundant FCF, as they overestimate the returns from their investment projects. Thus, when managers announced increases in capital expenditure, the market potentially recognized that these investments would be negative NPV projects, financed with internal funds, debt and little equity (Baker & Wurgler, 2013; Heaton, 2002). As shown by Malmendier et. al. (2011) overconfident CEOs prefer debt to equity when financing to a degree where they will take on about 33 cents additional debt per USD of required external funds compared to rational CEOs.

5.2.4 Miscalibration

Second, considering miscalibration, managers tend to underestimate their firms' future outcomes such as the standard deviation of their firms' cash flows, or overestimate the information provided by signals during decision-making (Ben-David et al., 2013; Malmendier, 2018). The managers' views could also be argued to be miscalibrated when the oil price fell in 2014. Considering that managers' believed in a temporary oil price decrease, potentially overestimating the information from the industry's signals (Ben-David et al., 2013; Bøhm & Mohn, 2017; Malmendier, 2018). This behavior could have been present in the period prior to the oil price decrease in 2014 and the managers might have been miscalibrated about the standard deviation of their firms' future cash flows as well (Ben-David et al., 2013; Malmendier, 2018). Miscalibration could have led to valuation errors when managers applied the NPV decision rule, as their firms' cash flows and discount rate might have been wrongfully estimated. Considering that the firms' systematic risk exposure might have been perceived to be too small, their future cash inflows too high and cash outflows too low, this would be disastrous due to the oil and gas industry's long project length. As a result, the rational stock market might have responded by lowering the firms' stock prices when they announced increases in capital expenditure.

5.2.5 Attribution theory

Biases from attribution theory might strengthen overconfidence (Ackert & Deaves, 2016). First, with self-attribution bias, successful projects are viewed by the managers as a consequence of their abilities, while unsuccessful projects are due to factors outside their control (Gervais & Odean, 2001; D. T. Miller & Ross, 1975). If managers are overconfident, a period of high oil prices might have caused negative NPV projects that would otherwise be a failure to succeed, increasing managerial overconfidence. In addition, a time period with negative shocks to the oil price, might have provided good excuses for the failures of negative NPV projects. Second, with hindsight bias, managers might have had a belief that they could have predicted their projects outcomes (Hawkins & Hastie, 1990). This might have made it easier to put the blame for their failures on other factors outside their control, while success are still deemed due to own abilities. Finally, confirmation bias might increase overconfidence due to the way managers collect and process new information (Ackert & Deaves, 2016; Lord et al., 1979). Information that confirms the managers' point of view is accepted without much consideration. While information that does not support the managers' views are largely ignored or exposed to critical evaluation. Confirmation bias potentially had a great impact on the way managers interpreted the market signals in the sample period.

5.2.6 The positive aspects of overconfidence

As mentioned previously in Section 2.5.3, overconfidence is not necessarily only negative. As argued by Gervais et. al. (2011), moderate amounts of overconfidence reduces managers required compensation, as they need less incentive to take on sufficient amounts of risk. This is confirmed by Otto (2014) who found that principals pay optimistic CEOs less compensation compared to rational CEOs. However, this might not be important for integrated oil and gas companies' shareholders. Considering the individual shareholder's savings on the compensation contracts should be small relative to the potential damages to their wealth from biased executives' decisions. D. Hirshleifer et. al. (2012) argues that overconfident CEOs are preferred in industries defined by innovation and growth, as they tend to invest more in risky and challenging R&D. While Campbell et. al. (2011) argues that moderate CEO optimism can be valuable as it could increase investments to the optimal level by counteracting risk aversion.

The oil and gas industry relies on capital expenditure to explore, replace and develop their reserves portfolios (Mohn, 2008). Investments in new technological developments and exploration could potentially prolong the life of reserves close to depletion, or make previously unprofitable oil and gas fields profitable. Overconfident managers could potentially choose investments that would otherwise not be made by rational risk averse managers (Campbell et al., 2011). Increasing value for their shareholders when they are lucky and projects are profitable, while the opposite is true with failures. Therefore, a time period with high oil price might have been favorable for overconfident managers. The boards might have prolonged the overconfident managers' positions longer than usual, even though they had knowledge of managerial overconfidence. Considering the high oil prices and following cash flows potentially saved the managers' risky and negative NPV projects, and as argued by Goel and Thakor (2008) boards tolerate moderate amounts of overconfidence. Overconfident managers might have kept their jobs longer than in previous time periods as their projects potentially had a higher probability of success. In addition, as they kept their jobs longer, they might have become more overconfident, potentially due to the three biases from attribution theory (Ackert & Deaves, 2016).

5.2.7 Reducing irrational overinvestment

Considering the market conditions and the firms' capital structure where internal financing was predominately used (IEA, 2016, 2017, 2018a). The rational market potentially viewed executives as being overconfident, as the stock market responds negatively to increases in capital expenditure as if managers were overinvesting in perceived positive NPV projects (Baker & Wurgler, 2013; Malmendier & Tate, 2008; Malmendier, 2018). The two components of overconfidence, overoptimism and miscalibration, might have caused agency problems during the sample period (Malmendier, 2018).

Since overconfidence is hard to correct and potentially common among managers (Ackert & Deaves, 2016; Goel & Thakor, 2008). Attempting to reduce overconfident managers' overinvestment is important. Malmendier and Tate (2005, 2008, 2015) argues that with managerial overconfidence, optimal compensation contracts are not able to align managers' and shareholders' interests. To avoid overinvestment in negative NPV projects when managers irrationally believe they are maximizing their own and shareholders wealth, boards needs to be active and independent to improve their firms' corporate governance structure. Boards should take part in the capital budgeting process to reduce the overconfident managers' influence as they choose poor investment projects (Malmendier & Tate, 2008). In addition, boards need to discipline and restrict the overconfident managers' use of internal financing, by constraining their capital structure options so they choose to take on sufficient amounts of equity (Baker & Wurgler, 2013; Malmendier & Tate, 2005, 2008). Considering the improvement of boards, Banerjee, Humphery-Jenner and Nanda (2015) and Kolasinski and Li (2013) confirms that improving boards reduces overconfident CEOs' overinvestment. In addition, Kolasinski and Li (2013) provide evidence that if overconfident CEOs experience losses when they invest in their own companies' shares, they are less likely to overinvest in the future.

6. Conclusion

This thesis attempts to find possible explanations to the research problem: Why does the stock prices of oil and gas companies not always respond in accordance with neoclassical standard financial theory when companies announce changes in capital expenditure plans? The research problem is deeply rooted within principal-agent theory, and to find answers two theories are applied. First, neoclassical standard financial theory, that assumes all market participants are rational (Becker, 1962). Second, behavioral corporate finance theory, with the biased managers perspective, that assumes managers are biased due to overconfidence, while all other market participants are rational (Baker & Wurgler, 2013; Malmendier, 2018).

Data from the following eight integrated oil and gas companies have been collected: Equinor, BP, Shell, Eni, Total, Chevron, ExxonMobil and ConocoPhillips. Due to the need for a benchmark denoted in a common currency, Dow Jones U.S. Oil & Gas Titans 30 Index, denoted in USD has been chosen. This benchmark covers the 30 leading companies in the global oil and gas industry, including the firms in the sample. Casual observations of integrated oil and gas companies' capital expenditure announcements indicate that the stock prices of oil and gas companies not always respond in accordance with neoclassical standard financial theory. Considering the fact, that oil is the most important primary energy resource in the world and the huge amounts of investments in the oil and gas industry (IEA, 2017, 2018c). It is important to obtain valuable insights into integrated oil and gas companies' investment and capital structure decisions. As potential deviating stock price behavior from neoclassical standard financial theory could lead to over- and underinvestment.

This thesis contributes with evidence that the stock market responded negatively to the eight integrated oil and gas companies' announcements of increased capital expenditure in the sample period. This deviates from neoclassical standard financial theory, where an increase in capital expenditure is a signal to the market of increased future positive NPV projects and therefore increased firm value and share price, as shareholders would immediately benefit from the investment projects (McConnell & Muscarella, 1985).

6.1 The thesis's main results

The research problem has been divided into two hypothesis. First, to answer whether the news presented on the event days have any effect on the behavior of the firms' stock prices. Three event studies are conducted to find evidence of abnormal return responses to the firms' announcements, which includes their capital expenditure plans. The analysis confirms correlations, where the announcements including increased capital expenditure plans result in statistically significant negative average cumulative abnormal return responses ranging from -0.33 to -2.00 percent in the different event windows. However, announcements including news of status quo and decreases in capital expenditure plans reveals mixed responses. Second, to answer whether the capital expenditure news have any effect on the behavior of the firms' stock prices. Three regression analysis attempts to determine if the capital expenditure news cause abnormal (daily) return responses. One of the three analysis reveals causality, the stock market responds negatively to increases in capital expenditure. If the firms increase capital expenditure, they experience a statistically significant negative abnormal (daily) return response of -1.66 percent.

In addition, the regression analysis reveals that the supermajors and the American firms in the sample experience statistically significant negative abnormal (daily) return responses ranging between -1.50 to -1.62 percent and -1.00 percent respectively. While, the GSEs and the European firms in the sample experience exactly the opposite. In addition, if the firms increase production with 1 mmboe and proved reserves with 1 billion barrels. It causes statistically significant negative abnormal (daily) return responses ranging between -0.41 to -0.55 percent and -0.15 to -0.19 percent respectively. It seems the rational market participants potentially requires more from the supermajors and American firms compared to the GSEs and European firms, or perhaps the GSEs and European firms have performed better than the supermajors and American firms in the sample period. However, the stock market is not pleased with the integrated oil and gas companies' production and proved reserves. Potentially the increases in capital expenditure lead to lower than preferred increases in production and proved reserves during the sample period.

6.2 The results' implications

With confirmation that the stock prices of the sample's oil and gas companies not always respond in accordance with neoclassical standard financial theory when they announce increases in capital expenditure plans. Neoclassical standard financial theory and behavioral corporate finance theory are applied to provide potentially explanations for the phenomenon.

First, neoclassical standard financial theory's potential explanations are that managers potentially did not use the NPV method or applied it properly (Graham & Harvey, 2001; Krüger et al., 2015). However, considering the industry's history, the market conditions and the firms' capital structure where internal financing was predominately used (IEA, 2016, 2017, 2018a; Jensen, 1986; McConnell & Muscarella, 1985). The most likely explanation comes from free cash flow theory, as there was high cash flows and FCFs in the sample period, increasing managerial power, causing rational overinvestment in negative NPV projects and the stock market responded by lowering the firms' stock prices (Jensen, 1986; McConnell & Muscarella, 1985). In addition, strengthening the issue, there was high oil and stock price volatility, the executives' compensation contracts might have been misaligned with the shareholders' interests (Hall & Liebman, 1998; Hall & Murphy, 2000, 2002). Second, the most likely explanation within behavioral corporate finance theory, is that managerial overconfidence might have caused irrational overinvestment in negative NPV projects and the rational market participants responded by lowering the firms' stock prices (Malmendier & Tate, 2008).

Both theories point towards excessive use of abundant internal funds as the culprit of the stock market's negative responses to increases in capital expenditure. The rational market participants need to find ways to restrict managers from using too much internal financing and at the same time avoid monitoring (Baker & Wurgler, 2013; M. Harris & Raviv, 1990; Jensen, 1986; Malmendier & Tate, 2005, 2008, 2015). If the rational market participants accomplish this, executives will potentially trade-off between debt and equity and choose the optimal capital structure that maximize the net benefits of debt and their firms' values (Jensen, 1986; Korteweg, 2010). First, within neoclassical standard financial theory and free cash flow theory, disciplining debt is a useful tool to reduce rational overinvestment (D'Mello & Miranda, 2010; M. Harris & Raviv, 1990; Jensen, 1986). Second, within behavioral corporate finance theory, active and independent boards that also take part in the capital budgeting process is a useful tool to reduce irrational overinvestment (Banerjee et al., 2015; Kolasinski & Li, 2013; Malmendier & Tate, 2005, 2008, 2015). In addition, boards should constrain overconfident managers' capital structure so they take on sufficient amounts of equity (Baker & Wurgler, 2013; Malmendier & Tate, 2005, 2008).

6.3 The thesis's weaknesses

First, a general weakness of the analysis, and the most important one, is that the companies mainly announce quarterly results and other important news at the same time they reveal their capital expenditure plans. This causes a lot of noise in and around the event days, and thus the three event studies measure the whole events' effects. Second, the two asymmetric models are the only models in the regression analysis that confirms that the market responds with negativity to increases in capital expenditure. There is also a high negative correlation of -0.83 between the dummy variables for increases and decreases in capital expenditure, however, multicollinearity should not be a concern. In addition, considering the responses to Good News in the event studies and the robustness of the dummy variable for increased capital expenditure, the stock market's negative responses to increases in capital expenditure seems appropriate. Third, another weakness is that nonparametric tests like the sign and rank tests have not been used to check the robustness of the parametric t-tests in the event studies (MacKinlay, 1997). However, due to the use of three event studies when calculating the abnormal returns and obtaining very similar t-test results, robustness should not be too much of a concern. Finally, further weaknesses relates to not knowing if executives' compensation contracts are aligned with shareholders' interests in the discussion of rational overinvestment. Nor having any solid evidence of overconfidence and thus, the biased managers perspective, in the discussion of irrational overinvestment.

6.4 The way forward

Further research should be made to improve the weaknesses of this thesis. First, the most important improvement would be to add more independent variables and thus create a multifactor market model (MacKinlay, 1997). Such a model would consider the most important and frequent news presented at the same time as capital expenditure plans. Reducing noise compared to the single factor market model applied in this thesis. For example, result surprises could be added. These observations represent analysts' predictions of firms' results compared to firms' actually presented results. Result surprise data have been collected for the sample. However, these surprises tend to occur on quarterly earnings announcements, while capital expenditure news does not necessarily occur at the same time. For the collected data, 16 of 88 observations did not occur on the same event date. This was most prevalent for ExxonMobil, which only had one viable observation, as they tend to announce capital expenditure at their analyst meetings.

Second, other important and frequent news reported on the event days should be added as independent variables to the regression analysis, increasing accuracy.

Finally, to gain insight into whether the managers are biased or not, Malmendier (2018) argues that it is standard in the literature to use at least two of the four overconfidence measures to gain robustness of the overconfidence results. Where the first approach was presented by Malmendier and Tate (2005) and is called the option-based approach. The second approach was presented by Otto (2014) and is called the earnings-forecast-based approach. Third, the survey-based approach used by Graham et. al. (2013) and finally the media-based approach used by Malmendier and Tate (2008). Malmendier (2018) argues further that when measuring overoptimism all four approaches could be used, while for miscalibration the survey-based approach is the most common. An overconfidence analysis would most likely include the popular option-based approach where information regarding executives' compensation contracts could also be obtained (Malmendier, 2018, p. 66-68).

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Appendix

Appendix 1. The constant mean return model

A1.1 The constant mean return model's 21-days event window average abnormal returns and cumulative abnormal returns in percent

Constant mean return model $(-10, 10)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-10	0.0569	0.0569	0.8444	0.8444	-0.3163	-0.3163
-9	-0.2395	-0.1826	-0.1059	0.7385	0.2021	-0.1142
-8	0.1144	-0.0682	-0.1581	0.5804	-0.4249	-0.5391
-7	-0.0374	-0.1056	0.2862	0.8666	0.1481	-0.3910
-6	-0.1354	-0.2409	-1.4129	-0.5463	0.0963	-0.2946
-5	-0.1591	-0.4000	-0.0311	-0.5774	0.6280	0.3334
-4	-0.5218	-0.9218	-0.0611	-0.6385	0.2420	0.5754
-3	-0.2267	-1.1485	0.8274	0.1889	-0.1039	0.4715
-2	0.0910	-1.0575	-0.1578	0.0311	-0.5739	-0.1024
-1	0.2274	-0.8301	-1.3320	-1.3009	-0.1486	-0.2510
0	-0.3854	-1.2156	0.9777	-0.3232	-0.2616	-0.5126
1	-0.4635	-1.6790	0.3390	0.0158	0.0314	-0.4812
2	-0.2790	-1.9580	0.2601	0.2759	0.4347	-0.0465
3	0.1399	-1.8181	-0.3221	-0.0462	-0.0930	-0.1395
4	-0.0046	-1.8227	0.4226	0.3764	-0.3639	-0.5034
5	-0.1159	-1.9387	0.4978	0.8743	0.4614	-0.0420
6	-0.3121	-2.2507	-0.4995	0.3747	0.1018	0.0598
7	0.2418	-2.0089	-1.0179	-0.6432	0.3213	0.3811
8	0.4941	-1.5148	-0.1469	-0.7900	0.1310	0.5121
9	0.0678	-1.4470	0.0358	-0.7542	-0.3845	0.1275
10	-0.0895	-1.5366	-0.4568	-1.2110	0.3666	0.4941

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A1.2 The constant mean return model's 11-days event window average abnormal returns and cumulative abnormal returns in percent

Constant mean return model $(-5, 5)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-5	-0.1591	-0.1591	-0.0311	-0.0311	0.6280	0.6280
-4	-0.5218	-0.6809	-0.0611	-0.0922	0.2420	0.8701
-3	-0.2267	-0.9075	0.8274	0.7352	-0.1039	0.7661
-2	0.0910	-0.8166	-0.1578	0.5774	-0.5739	0.1922
-1	0.2274	-0.5892	-1.3320	-0.7546	-0.1486	0.0436
0	-0.3854	-0.9747	0.9777	0.2231	-0.2616	-0.2180
1	-0.4635	-1.4381	0.3390	0.5621	0.0314	-0.1866
2	-0.2790	-1.7171	0.2601	0.8222	0.4347	0.2481
3	0.1399	-1.5772	-0.3221	0.5001	-0.0930	0.1551
4	-0.0046	-1.5818	0.4226	0.9227	-0.3639	-0.2088
5	-0.1159	-1.6978	0.4978	1.4205	0.4614	0.2526

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A1.3 The constant mean return model's 4-days event window average abnormal returns and cumulative abnormal returns in percent

Constant mean return model $(-2, 1)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-2	0.0910	0.0910	-0.1578	-0.1578	-0.5739	-0.5739
-1	0.2274	0.3183	-1.3320	-1.4898	-0.1486	-0.7225
0	-0.3854	-0.0671	0.9777	-0.5121	-0.2616	-0.9842
1	-0.4635	-0.5306	0.3390	-0.1731	0.0314	-0.9528

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A1.4 The constant mean return model's 2-days event window average abnormal returns and cumulative abnormal returns in percent

Constant mean return model $(0, 1)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
0	-0.3854	-0.3854	0.9777	0.9777	-0.2616	-0.2616
1	-0.4635	-0.8489	0.3390	1.3167	0.0314	-0.2302

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A1.5 The constant mean return model's 1-day event window average abnormal return and cumulative abnormal return in percent

Constant mean return model $(0,0)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$
0	-0.3854	-0.3854	0.9777	0.9777	-0.2616	-0.2616

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1,\tau_2)$ for the eight firms' Good, No and Bad News.

Appendix 2. The market-adjusted return model

A2.1 The market-adjusted return model's 21-days event window average abnormal returns and cumulative abnormal returns in percent

Market-adjusted return model $(-10,10)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$
-10	0.1465	0.1465	0.2260	0.2260	-0.1339	-0.1339
-9	0.0984	0.2449	-0.0964	0.1296	-0.1356	-0.2695
-8	0.1005	0.3454	0.4445	0.5741	-0.2765	-0.5460
-7	-0.3147	0.0307	0.0350	0.6091	0.0963	-0.4497
-6	0.0490	0.0796	-0.6554	-0.0463	0.0385	-0.4112
-5	-0.0895	-0.0098	-0.1413	-0.1876	0.2840	-0.1271
-4	-0.3755	-0.3853	-0.3981	-0.5856	0.2503	0.1232
-3	-0.0403	-0.4256	0.7709	0.1852	-0.2775	-0.1543
-2	0.0882	-0.3374	-0.3324	-0.1471	-0.0815	-0.2358
-1	-0.0972	-0.4346	-0.8736	-1.0207	0.0919	-0.1440
0	-0.3338	-0.7685	1.2894	0.2687	0.0661	-0.0778
1	-0.3369	-1.1053	0.3127	0.5815	-0.0249	-0.1027
2	0.1407	-0.9647	0.1857	0.7671	0.5121	0.4093
3	0.0204	-0.9443	-0.4198	0.3473	-0.0435	0.3658
4	0.0167	-0.9276	0.3500	0.6973	-0.4281	-0.0623
5	-0.0176	-0.9451	-0.0929	0.6044	0.1800	0.1178
6	-0.2780	-1.2231	-0.5565	0.0479	0.1264	0.2442
7	-0.0041	-1.2272	-0.2843	-0.2363	0.1832	0.4273
8	0.2694	-0.9578	0.1994	-0.0369	-0.0769	0.3504
9	-0.0156	-0.9734	0.1044	0.0675	-0.1722	0.1782
10	-0.1413	-1.1147	-0.2075	-0.1400	0.0402	0.2184

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1,\tau_2)$ for the eight firms' Good, No and Bad News.

A2.2 The market-adjusted return model's 11-days event window average abnormal returns and cumulative abnormal returns in percent

Market-adjusted return model $(-5, 5)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-5	-0.0895	-0.0895	-0.1413	-0.1413	0.2840	0.2840
-4	-0.3755	-0.4649	-0.3981	-0.5393	0.2503	0.5344
-3	-0.0403	-0.5052	0.7709	0.2315	-0.2775	0.2569
-2	0.0882	-0.4170	-0.3324	-0.1008	-0.0815	0.1753
-1	-0.0972	-0.5142	-0.8736	-0.9744	0.0919	0.2672
0	-0.3338	-0.8481	1.2894	0.3150	0.0661	0.3333
1	-0.3369	-1.1850	0.3127	0.6278	-0.0249	0.3084
2	0.1407	-1.0443	0.1857	0.8134	0.5121	0.8205
3	0.0204	-1.0239	-0.4198	0.3936	-0.0435	0.7770
4	0.0167	-1.0072	0.3500	0.7436	-0.4281	0.3489
5	-0.0176	-1.0247	-0.0929	0.6507	0.1800	0.5289

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A2.3 The market-adjusted return model's 4-days event window average abnormal returns and cumulative abnormal returns in percent

Market-adjusted return model $(-2, 1)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-2	0.0882	0.0882	-0.3324	-0.3324	-0.0815	-0.0815
-1	-0.0972	-0.0090	-0.8736	-1.2059	0.0919	0.0104
0	-0.3338	-0.3429	1.2894	0.0835	0.0661	0.0765
1	-0.3369	-0.6797	0.3127	0.3962	-0.0249	0.0516

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A2.4 The market-adjusted return model's 2-days event window average abnormal returns and cumulative abnormal returns in percent

Market-adjusted return model $(0, 1)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
0	-0.3338	-0.3338	1.2894	1.2894	0.0661	0.0661
1	-0.3369	-0.6707	0.3127	1.6022	-0.0249	0.0412

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A2.5 The market-adjusted return model's 1-day event window average abnormal return and cumulative abnormal return in percent

Market-adjusted return model $(0, 0)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
0	-0.3338	-0.3338	1.2894	1.2894	0.0661	0.0661

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

Appendix 3. The market model

A3.1 The market model's 21-days event window average abnormal returns and cumulative abnormal returns in percent

Market model $(-10, 10)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
-10	0.1465	0.1465	0.1332	0.1332	-0.1696	-0.1696
-9	0.0592	0.2057	-0.0600	0.0732	-0.2522	-0.4218
-8	0.0675	0.2732	0.4210	0.4942	-0.2198	-0.6416
-7	-0.3254	-0.0522	0.0108	0.5050	0.0552	-0.5865
-6	0.0917	0.0395	-0.7112	-0.2062	-0.0134	-0.5998
-5	-0.0431	-0.0036	-0.1568	-0.3630	0.2535	-0.3464
-4	-0.3392	-0.3428	-0.3939	-0.7569	0.1685	-0.1779
-3	-0.0192	-0.3619	0.7264	-0.0305	-0.2645	-0.4424
-2	0.1557	-0.2062	-0.5544	-0.5848	-0.0317	-0.4742
-1	-0.0488	-0.2550	-0.9251	-1.5099	0.0118	-0.4624
0	-0.3374	-0.5923	1.3228	-0.1872	-0.0203	-0.4827
1	-0.3279	-0.9202	0.2142	0.0270	0.0036	-0.4791
2	0.1679	-0.7523	0.2069	0.2339	0.5417	0.0627
3	0.0399	-0.7124	-0.3609	-0.1270	0.0020	0.0647
4	-0.0145	-0.7270	0.3955	0.2685	-0.4437	-0.3791
5	-0.0322	-0.7592	-0.2320	0.0365	0.2188	-0.1603
6	-0.2641	-1.0233	-0.4692	-0.4327	0.0781	-0.0822
7	0.0087	-1.0145	-0.2576	-0.6903	0.1517	0.0695
8	0.2817	-0.7328	0.1335	-0.5568	-0.0282	0.0414
9	-0.0453	-0.7781	-0.0302	-0.5870	-0.1116	-0.0702
10	-0.1051	-0.8832	-0.2280	-0.8150	0.0872	0.0171

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.

A3.2 The market model's 11-days event window average abnormal returns and cumulative abnormal returns in percent

Market model $(-5,5)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$
-5	-0.0431	-0.0431	-0.1568	-0.1568	0.2535	0.2535
-4	-0.3392	-0.3822	-0.3939	-0.5507	0.1685	0.4219
-3	-0.0192	-0.4014	0.7264	0.1757	-0.2645	0.1574
-2	0.1557	-0.2457	-0.5544	-0.3786	-0.0317	0.1257
-1	-0.0488	-0.2944	-0.9251	-1.3037	0.0118	0.1375
0	-0.3374	-0.6318	1.3228	0.0190	-0.0203	0.1172
1	-0.3279	-0.9597	0.2142	0.2332	0.0036	0.1208
2	0.1679	-0.7918	0.2069	0.4401	0.5417	0.6625
3	0.0399	-0.7519	-0.3609	0.0792	0.0020	0.6645
4	-0.0145	-0.7665	0.3955	0.4747	-0.4437	0.2208
5	-0.0322	-0.7987	-0.2320	0.2427	0.2188	0.4396

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1,\tau_2)$ for the eight firms' Good, No and Bad News.

A3.3 The market model's 4-days event window average abnormal returns and cumulative abnormal returns in percent

Market model $(-2,1)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$
-2	0.1557	0.1557	-0.5544	-0.5544	-0.0317	-0.0317
-1	-0.0488	0.1070	-0.9251	-1.4795	0.0118	-0.0199
0	-0.3374	-0.2304	1.3228	-0.1567	-0.0203	-0.0402
1	-0.3279	-0.5583	0.2142	0.0575	0.0036	-0.0366

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1,\tau_2)$ for the eight firms' Good, No and Bad News.

A3.4 The market model's 2-days event window average abnormal returns and cumulative abnormal returns in percent

Market model $(0,1)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1,\tau_2)$
0	-0.3374	-0.3374	1.3228	1.3228	-0.0203	-0.0203
1	-0.3279	-0.6653	0.2142	1.5369	0.0036	-0.0167

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1,\tau_2)$ for the eight firms' Good, No and Bad News.

A3.5 The market model's 1-day event window average abnormal return and cumulative abnormal return in percent

Market model $(0, 0)$						
Event	Good News		No News		Bad News	
day τ	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$	$\overline{AR}_\tau$	$\overline{CAR}(\tau_1, \tau_2)$
0	-0.3374	-0.3374	1.3228	1.3228	-0.0203	-0.0203

Note: The sample's $\overline{AR}_\tau$ and $\overline{CAR}(\tau_1, \tau_2)$ for the eight firms' Good, No and Bad News.