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Earnings management in response to the oil price shock of 2014: Evidence from Oslo Stock Exchange

Earnings management og oljeprissjokket i 2014: Bevis fra Oslo Børs

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Abstract

This thesis studies the relationship between the oil price shock of 2014 and earnings management in Oslo Stock Exchange listed oil companies. We analyse whether investors and other stakeholders need extra scepticism to the financial statements during a crisis. Following prior research, well-established discretionary accruals models are used to estimate earnings management behaviour. By using a bootstrapping procedure, we test whether there is a significant difference in earnings management between the pre-crisis and the crisis period. The results show a significant increase in earnings management following the oil price drop. Moreover, we investigate which direction companies adjust earnings and find abnormal income-decreasing accruals during the third and fourth quarter of 2014. We attribute this finding to the big bath strategy, where managers manipulate earnings downward to make poor results worse, artificially enhancing subsequent earnings as the accruals reverse.

This thesis contributes to the literature in several ways. First, to the understanding of the effect of macroeconomic shocks on earnings management behaviour. Second, we supplement the earnings management literature on oil and oil-related companies by looking at how a negative oil price shock affects oil companies. And third, we contribute to the limited research on earnings management in a Norwegian context.

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1. Introduction

The earnings management literature has traditionally focused on the determinants and consequences of financial information manipulation, holding the macroeconomic environment constant or assuming it not to have an impact. In the last decade, and especially after the global financial crisis, this assumption has been challenged. Empirical research shows that dramatic changes in the economic climate impact companies propensity to manage earnings, but provides no consensus on how or in what direction. The purpose of this paper is to supplement the earnings management literature by examining accounting choices in Oslo Stock Exchange listed oil companies in response to the oil price shock of 2014.

The oil price drop of 2014 sent shock waves through the oil industry. From June 2014 to January 2015, the price of Brent crude oil per barrel dropped from around $115 to $46. This downfall is mainly attributed to USA's increased shale oil production and OPEC's decision of keeping their production stable, deciding that low oil prices offer more long-term benefits than giving up market share (McCain, 2015). The drop led to the loss of more than 40 000 jobs in Norway between 2014-2016 (Kaspersen, 2016), illustrating the oil industry's significance for the Norwegian economy and making Norwegian listed oil companies especially interesting to study.

In turbulent times, the reliability of financial statements is particularly essential to the stakeholders. Information asymmetry between preparers and users of financial information makes opportunistic altering possible, which reduces the quality of financial reporting (Arthur, Tang and Lin, 2015). Basu *et al*. (2013) state that financial reports are the most important source of information to investors, analysts and debtors. Knowledge of an industry's inclination to engage in earnings management activities in times of crisis[1] is therefore of critical value to users of financial information.

Intuitively, there are reasons to support assumptions of both more and less earnings management in an industry in crisis. Higher scrutiny by regulators, financial analysts and other stakeholders

[1] We define the oil price shock of 2014 as a crisis for the oil industry (Fredriksen and Johansen, 2014).

gives incentives to less risk taking and more accurate financial statements. Volatile environments could conversely also encourage more earnings management. A decrease in actual performance may be met by income-increasing accounting choices to maintain reported performance (Filip and Raffournier, 2014). However, if substantial losses are unavoidable, a big bath strategy could be encouraged, where companies make poor results worse and thus enhancing next year's earnings as the accruals reverse. Empirical evidence is inconclusive as to how macroeconomic crises affect earnings management behaviour. While most studies find an effect, there is no consensus on the direction (Rusmin, Scully and Tower, 2012, Filip and Raffournier, 2014, Persakis and Iatridis, 2015).

Due to the historical proximity of the oil price crisis of 2014, no earnings management research is conducted on this event. While previous events are analogous, important differences exist. First, the financial crisis literature investigates all sectors of the economy. By analysing the oil industry alone, we manage to isolate the response to a dramatic change in output price for the most affected companies. Second, to the best of our knowledge, no studies have analysed the effect of a negative oil price shock on earnings management in the oil industry. And third, limited published research investigate Norwegian companies accounting choices in response to a severe economic downturn. The purpose of this paper is to fill these gaps and provide valuable insights for users of financial statements.

Following prior research, earnings management is measured with discretionary accruals models well-established in the literature. By estimating the models using a sample of 782 quarterly observations, our results indicate that the Oslo Stock Exchange listed oil companies managed earnings to a larger degree during the oil price crisis, compared to the preceding period. Further analysis provides evidence of significant income-decreasing earnings management in the third and fourth quarter of 2014, pointing to big bath accounting choices. This implies that the trustworthiness and value of the financial reports in the oil industry in times of crisis are reduced.

The remainder of this paper is organised as follows. Section 2 discusses the previous literature related to our thesis. Section 3 provides the theoretical development of the hypotheses, followed

by section 4 about the dataset and research design. Section 5 presents the empirical results and section 6 concludes the paper's findings, limitations and suggestions for future research.

2. Literature review

Healy and Wahlen's (1999, p. 368) definition of earnings management is the most commonly cited:

> *Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers.*

The definition contains two separate ways of altering the financial reporting. Accrual-based earnings management occurs when management opportunistically applies accounting standards to manage earnings in a desired direction. Real activities manipulation is management changing the timing or structuring of operations, investments or financial transactions. Contrary to accrual-based earnings management, these activities have direct and suboptimal business consequences (Zang, 2012). In a survey of more than 400 executives, Graham, Harvey and Rajgopal (2005) find that both techniques are used to manipulate earnings. Due to data availability and time limitations, this study focuses on accrual earnings management.

The majority of papers in the literature study different incentives for earnings management, categorised by Fields, Lys and Vincent (2001) into three main groups: contractual arrangements, asset pricing and third-party decisions. Examples of these incentives for earnings management are manager's bonus schemes, tax reductions, management buyouts, IPO's and meeting or beating analysts' expectations.[2] A common characteristic of incentive studies is that they hold the macroeconomic environment constant. Macroeconomic events could, however, work as an incentive itself.

[2] Managers bonus schemes (Healy, 1985; Holthausen, Larcker and Sloan, 1995; Gaver, Gaver and Austin, 1995), tax reductions (Burgstahler and Dichev, 1997; Tao, 2014), management buyouts (Perry and Williams, 1994; Mao and Renneboog, 2015), IPO's (Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995; Teoh, Welch and Wong, 1998), meeting or beating analysts' expectations (Degeorge, Patel and Zeckhauser, 1999; Bartov, Givoly and Hayn, 2002; Yu, 2008)

Healy (1985, p. 86) states:

> *If earnings are so low that no matter which accounting procedures are selected target earnings will not be met, managers have incentives to further reduce current earnings by deferring revenues or accelerating write-offs, a strategy known as "taking a bath".*

When used as an earnings management technique, big baths deteriorate the information climate and obscure operating performance. But if asset market value is less than book value, write-downs can improve the information environment and reduce information asymmetry (Hope and Wang, 2018).

High-quality earnings management research in a Norwegian context is scarce. Kinserdal (2006) concludes that Norwegian listed companies use pension valuation to manage earnings. Leuz, Nanda and Wysocki (2003) investigate earnings management across different countries and find that the level of investor protection strongly affects earnings management behaviour and that Norway is among the countries with the least earnings management. Similar results are presented by Shen and Chih (2005), who look at loss avoidance in the banking industry. Filip and Raffournier (2014) find that Norwegian companies follow the same pattern as most other European countries and engage in less earnings management after the financial crisis of 2008.

Empirical research on the effect of different economic environments is ambiguous. Agarwal *et al.* (2007) study Japanese banks under three distinct economic environments, high-growth, stagnant growth and severe recession. The banks used loan loss provisions to manage earnings during both economic high-growth and stagnant growth periods, but not during the recession. Similarly, Jenkins, Kane and Velury (2009) report that accounting conservatism and value relevance of earnings are higher during economic contractions because firms report more conservatively during a recession to avoid litigation risk and regulatory scrutiny. Contrary findings are presented by Ze-To (2012) who study NYSE and AMEX markets companies from the period 1989-2007. His evidence suggests that firms manage earnings both in the economic growth state and the recession state.

Although no prior literature exists on the effect of the oil price drop of 2014, other events such as the Asian financial crisis, Mexican currency crisis and the global financial crisis of 2008 are

similar in the sense that they represent major negative shocks to the economy. This literature should give indications regarding what to expect from earnings management activity following the oil price shock. Davis-Friday and Gordon (2005) find that the relevance of earnings does not decline during the Mexican currency crisis. To the contrary, Graham, King and Bailes (2000) and Ho, Liu and Sohn (2001) state that earnings relevance decreased during the Asian financial crisis. Ahmad-Zaluki, Campbell and Goodacre (2011) identify more income-increasing earnings management for IPO firms during the Asian financial crisis. In the context of the Malaysian financial crisis, Saleh and Ahmed (2005) find income-decreasing earnings management for financially distressed firms.

The global financial crisis of 2008 is arguably the most comparable crisis to our event since it is the most recent and the majority of the research is done in a European setting. Numerous studies examine its effect on financial reporting choices. Persakis and Iatridis (2015) study the impact of the global financial crisis on earnings quality in publicly listed firms in advanced countries as per level of investor protection. Their results show that earnings decreased during the financial crisis, especially for the countries which are characterised by medium and weak shareholder protection. In a study of Asian transportation firms, Rusmin, Scully and Tower (2012) research the smoothing behaviour in seven Asian countries. They find empirical evidence suggesting that corporate managers opportunistically smooth income to beat earnings targets and engage in big bath practises. Habib, Bhuiyan and Islam (2013) investigate the managerial earnings management practices of financially distressed firms and whether these practices changed during the financial crisis, finding that managers of troubled firms engage in more income-decreasing earnings management compared to their healthy firm counterparts.

The literature is, however, conflicting. Filip and Raffournier (2014) find that there is a significant decrease of income smoothing and improved accruals quality in the crisis period. This trend is confirmed for most of the 16 EU countries under review. Similar findings were reported by Kousenidis, Ladas and Negakis (2013), who examine whether and to what extent the financial crisis of 2008 impacted the quality of the reported earnings of listed firms in EU countries with weak fiscal sustainability. The results show that, on average, earnings quality improved during the financial crisis. Arthur, Tang and Lin (2015) compare the earnings quality of firms in 14

European countries during the 2005–2007 period and during the financial crisis period (2008–2010). The firms tended to present higher-quality financial reports during the financial crisis than prior to it. Cimini (2015) present resembling findings in a study of non-financial entities listed in EU countries.

Differences in the research design may be part of the reason why the crisis literature is inconclusive. Some studies take a country-by-country approach (Persakis and Iatridis, 2015), while others merge all countries into the same sample (Arthur, Tang and Lin, 2015). Differences in reporting culture, investor protection and economic environment may affect how a crisis changes earnings management behaviour, leading to conflicting results. Further, most event-studies look at the whole economy. Downturns, however, do not have the same impact on every industry which could result in contrasting incentives. This study focuses on the industry hardest hit by the oil price drop of 2014, and we believe that the reporting incentives should be more similar than for the majority of previous studies.

Most previous studies on the oil industry examine the effect of a positive change in oil prices. Studies on the Persian Gulf crisis (Han and Wang, 1998), hurricanes Katrina and Rita (Byard, Hossain and Mitra, 2007), and the Arab Spring (Hsiao, Hu and Lin, 2016) point to income-decreasing earnings management following the respective shocks. Byard, Hossain and Mitra (2007) and Han and Wang (1998) attribute their findings to the political cost hypothesis (Watts and Zimmerman, 1986), while Hsiao, Hu and Lin (2016) findings suggest that there may be other incentives such as income smoothing. Cormier and Magnan (2002) study Canadian oil and gas firms for a 12-year period (1985-1996) not connected to any particular event, finding some evidence of systematic earnings management. These studies signal that oil companies are willing to engage in earnings management, but there is a gap in the literature as to how they would react to an oil price drop.

3. Hypothesis development

Intuition and research on comparable crises give conflicting guidance of what to expect of accounting choices in oil companies listed on Oslo Stock Exchange in response to the crisis. Solid intuitive arguments support improved quality of financial reporting during an economic

recession. Since investors already expect the performance to be weak, the consequences of delivering negative numbers become lower and, likewise, incentives to artificially inflate earnings become weaker (Filip and Raffournier, 2014). Another aspect is that during an economic downturn, conservativeness from auditors is required as the probability of client bankruptcy and litigation risk increase. This development could cause a greater tendency to issue qualified audit reports (Xu *et al.*, 2013).

Despite the incentives for less earnings management during a crisis, research also points in the opposite direction. In periods of financial distress information asymmetry increases, providing managers better opportunity and incentives to exercise their accounting discretion (Liao *et al.*, 2013). Moreover, when the operational performance is expected to be low, it gives managers an opportunity to clean up their accounts by engaging in big bath practices (Saleh and Ahmed, 2005). There is also evidence suggesting that managers of financially distressed firms engage in income-increasing earnings management activities to avoid debt covenant violations or IPO's (Sweeney, 1994; Ahmad-Zaluki, Campbell and Goodacre, 2011; Anand, 2013). Most importantly, prior event studies on oil price increases find that the oil industry has previously taken advantage of volatile environments to exercise their discretion over the accrual process (Han and Wang, 1998; Byard, Hossain and Mitra, 2007; Hsiao, Hu and Lin, 2016), which gives reason to suspect similar decisions are made in crisis periods.

Based on the previous arguments we present the following hypothesis:

H1: Oslo Stock Exchange listed companies in the oil industry engage in more earnings management during the oil price crisis, compared to the preceding period.

If there is more earnings management in the crisis period, it can take the form of either income-decreasing or income-increasing accounting choices. Income-increasing choices can be rational during an oil price crisis where several companies struggle with the profitability. By managing earnings upwards, managers give the impression of being able to deal with the crisis better than their competitors. Further, Degeorge, Patel and Zeckhauser (1999) highlight the importance of meeting last year's result and avoid delivering negative results. Empirical evidence also suggests

that managers of financially distressed firms could have an increased tendency towards income-increasing choices (Defond and Jiambalvo, 1994; Sweeney, 1994; Smith, Kestel and Robinson, 2001; Anand, 2013). In a relevant event study, Ahmad-Zaluki, Campbell and Goodacre (2011) find evidence of income-increasing earnings management during the Asian financial crisis.

The use of income-decreasing earnings management could also be rational in response to the oil price drop. For managers of companies with substantial debt, a decrease in earnings could lead to benefits in debt renegotiations. Under the financial crisis in Malaysia, Saleh and Ahmed (2005) find an extensive use of negative discretionary accruals for financially distressed firms. Another reason for downward earnings management during a crisis is to build up a buffer for the future (Ghazali, Shafie and Sanusi, 2015). The stakeholders already expect the operational performance to be low and managers can blame the current low earnings on the economic environment. The firm will then report better results in the aftermath of the crisis, as the accruals reverse. Rusmin, Scully and Tower (2012) find evidence of such big bath behaviour in their study of Asian transportation firms during the financial crisis.

We expect the incentives to managers from downward earnings management, and specifically big bath accounting choices, to dominate the incentives from upward earnings management. Considering that accruals reverse, this strategy is difficult to use for several consecutive periods, and we therefore predict that the strategy will be most prevalent at the start of the crisis. This discussion leads up to our second hypothesis:

H2: Oslo Stock Exchange listed oil companies engage in income-decreasing earnings management in the third and fourth quarter of 2014.

4. Sample selection and research design

4.1 Event period

Identification of the event period and the preceding period is required to conduct our event study. The beginning of the crisis period is quite easily identifiable. During the third quarter of 2014, the price per barrel of Brent crude oil went from more than $110 to under $50, the largest drop

since 2008. The fourth quarter of 2016 marks the end of the crisis period since companies on Oslo Stock Exchange were no longer required to report quarterly financial statements with effect from January 2017 (Oslo Børs, 2016). Two competing considerations come into play when deciding the length of the preceding period. While we would like as many observations as possible to increase the power of statistical techniques, it is desirable that stable oil prices characterise the baseline period. We selected the first quarter of 2011 as a compromise. After recovering from the dramatic decrease caused by the financial crisis of 2008, the oil price is relatively stable in this period (Figure 1).

Figure 1: Daily Brent Crude Oil Spot Price Per Barrel, January 2010-December 2017 extracted from Thomson Reuters.

4.2 Data and sample selection

Our initial dataset consisted of quarterly financial statements from 54 Oslo Stock Exchange listed companies on the fossil energy index in the Thomson Reuters Eikon database. A qualitative assessment of the financial statements was executed to ensure that the firms were adequately affected by the oil price crisis. Companies not mentioning the oil price drop were excluded, including six companies dealing with natural gas. To increase comparability between

the two periods, we deleted companies with unavailable data in the research period.[3] For the same purpose, we excluded companies not reporting according to IFRS. Since GAAP allows less managerial discretion (Evans *et al*., 2014), we argue that including such companies could distort our data. Three companies were added to our initial sample because they were listed in our research period but delisted prior to the data extraction. Every variable was deflated with lagged total assets to mitigate problems related to heteroscedasticity, leading to the loss of 31 observations. Our final sample consists of 34 companies and a total of 782 firm-quarter observations. Ideally, a larger sample would be preferred, but similar sample sizes are used in comparable studies (Cormier and Magnan, 2002; Byard, Hossain and Mitra, 2007; Hsiao, Hu and Lin, 2016).

Table 1: Sample selection

Oslo Stock Exchange listed fossil energy companies	54
- GAAP firms	3
- Non-oil related firms	6
- Firms lost due to lack of data	14
+ Additional firms added to the sample	3
= Firms included in the sample	34
Initial firm-quarter observations for 2011-2016	1296
- GAAP firm-quarters	72
- Non-oil related firm-quarters	144
- Observations lost due to the lack of data	336
- Observations lost due to the requirement of lagged total assets	31
+ Additional firm-quarter observations added to the sample	69
= Final sample	782

Similar to Byard, Hossain and Mitra (2007) and Hsiao, Hu and Lin (2016) we use data from quarterly reports for the analysis. Quarterly data provides a sharper focus on the event by catching more of the fluctuations in earnings, increasing the likelihood of detecting earnings management. Besides, most of the financial statements for the interim quarters are unaudited, which allows greater managerial discretion and requiring less detailed disclosure than annual financial statements (Jeter and Shivakumar, 1999).

[3] We manually added data for companies lacking certain posts, by examining published quarterly reports.

4.3 Measurement of earnings management

To test our hypotheses, we employ different discretionary accrual models well-established in the literature. The intuition behind these regression models is that accruals unexplained by specific firm characteristics are discretionary accruals, which could be the result of either unintentional misjudgement or intentional earnings management. The techniques are heavily debated among researchers and criticised for producing errors of both type 1 and type 2 (Dechow, Ge and Schrand, 2010, Gerakos, 2012). Correlations between the proxy of earnings management and total accruals, correlated omitted variables and model misspecification can lead to false positives and false negatives.

For hypothesis 1, we try to mitigate these problems by using three different models: Modified Jones (1995), Kothari, Leone and Wasley (2005) and the Larcker model modified by Cimini (2015). The first two models are conventional in the earnings management literature, while Cimini's model is applied in a relevant financial crisis study. If the different models give the same indications, it should increase the reliability of the findings and reduce the probability of erroneous conclusions. All variables used in the different models are winsorized at the top and bottom 1 percent of their distributions to control for outliers.[4]

The first metric of earnings management is the Modified Jones model developed by Dechow, Sloan and Sweeney (1995). In equation (1) A_{it}, ΔREV_{it}, ΔREC_{it} and PPE_{it} are included to control for size, changes in sales and accounts receivables, and the level of property plant and equipment. The residuals of equation (1) represent abnormal or discretionary accruals and are the component of interest in this part of the study. Francis *et al*. (2005) argue that large discretionary accruals do not necessarily translate to poor accrual quality, as long as the level is consistently high and therefore predictable. Large standard deviation, however, indicate low accruals quality and more earnings management. The standard deviation of the residuals is our measure of earnings management.

$$TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \varepsilon_{it} \quad (1)$$

[4] Winsorizing is a common procedure employed in empirical research on earnings management (Francis *et al*., 2005; Kothari, Leone, and Wasley, 2005; Dechow *et al*., 2012).

Variable definitions:

TA_{it} total accruals, computed as net income after tax – operating cash flow, deflated by lagged total assets for company i in quarter t

A_{it-1} lagged total assets for company i in quarter t

ΔREV_{it} change in total sales deflated by lagged total assets for company i in quarter t

ΔREC_{it} change in account receivables deflated by total assets for company i in quarter t

PPE_{it} net value of property, plant and equipment deflated by lagged total assets for company i in quarter t

The second model is developed by Kothari, Leone and Wasley (2005), who extend the Modified Jones model by adding return on assets as an additional variable. Kothari, Leone and Wasley (2005) argue that both economic intuition and empirical evidence suggest that accruals correlate with a firm's present and past performance. By including ROA in the model, it controls for the impact of firm performance on unexpected accruals. The standard deviation of the residuals from equation (2) represents the proxy of earnings management. As for the Modified Jones model, a low standard deviation of the residuals will indicate higher accrual quality.

$$TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 ROA_{it} + \varepsilon_{it} \quad (2)$$

New variable definition

ROA_{it} net income after tax deflated by lagged total assets for company i in quarter t

The remaining variables in equation (2) are defined previously.

Cimini's (2015) modification of the Larcker and Richardson (2004) model takes a slightly different approach and provides the last metric of earnings management. By adding market-to-book to the Modified Jones model, the model controls for firms' characteristics such as income persistence and stability. Dechow *et al*. (2012) argue that the discretionary accruals models are misspecified for firms with extreme performance, but by including operating cash flow as an explicative variable this concern is avoided (Cimini, 2015). Similar to the two previous models, the standard deviation of the residuals represents our proxy of earnings management.

$$TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 MB_{it} + \beta_5 OCF_{it} + \varepsilon_{it} \quad (3)$$

New variables definitions:

MB_{it} is the market-to-book ratio (i.e. market value to book value of equity) for company i in quarter t

OCF_{it} operating cash flow for company i in quarter t

The remaining variables in equation (3) are defined previously.

Our second hypothesis is tested with a methodology used in previous studies on earnings management in the American oil industry (Han and Wang, 1998; Byard, Hossain and Mitra, 2007; Hsiao, Hu and Lin, 2016). In equation (4), CRISISQ3 and CRISISQ4 are dummy variables that equal 1 for the third and fourth quarter of 2014, respectively, and zero otherwise. They are the variables of interest and test whether firms book abnormal income-decreasing accruals in the third and fourth fiscal quarter of 2014. Earlier studies suggest that firms book more accruals in the last quarter of the year (Das, Shroff and Zhang, 2009). Quarterly dummies for Q2, Q3 and Q4 are implemented to avoid attributing this effect to the crisis period variables. Since the second hypothesis predicts income-decreasing earnings management during the crisis, the two crisis variables are expected to have a negative sign.

$$TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 OCF_{it} + \beta_5 ROA_{it} + \beta_6 LEV_{it} + \beta_7 MB_{it} + \alpha_1 Q_2 + \alpha_2 Q_3 + \alpha_3 Q_4 + \gamma_1 Y_{12} + \gamma_2 Y_{13} + \gamma_3 Y_{14} + \gamma_4 Y_{15} + \gamma_5 Y_{16} + \lambda_1 CRISISQ3 + \lambda_2 CRISISQ4 + \varepsilon_{it} \quad (4)$$

New variables definitions:

LEV_{it} leverage for company i in quarter t, calculated as total liability deflated by lagged total assets

Q_j indicator variable, which equals to 1 for fiscal quarter j (j = 2, 3 or 4), and zero otherwise

Y_k indicator variable, which equals to 1 for fiscal year k (k = 2012, 2013, 2014, 2015, 2016), and zero otherwise

CRISISQ3 dummy variable equal to 1 for the third quarter of 2014 and zero otherwise.

CRISISQ4 dummy variable equal to 1 for the fourth quarter of 2014 and zero otherwise

The remaining variables in equation (4) are defined previously.

We initially estimated equations (1)-(4) using ordinary least squares (OLS). Additional analysis of the residuals from these estimations displayed significant first and fourth order autocorrelation and heteroscedasticity. To adjust for this distortion, we estimate equations (1)-(3) using random effects panel data regression with robust standard errors. Equation (4) is estimated with fixed effects regression with robust standard errors. [5] Since a high correlation between independent variables could lead to imprecise results, we perform a multicollinearity test in the form of a correlation matrix and Variance Inflation Factors. The correlation matrix and VIF index for the variables are reported in the Appendix. All VIFs are below 5, indicating that multicollinearity is not a problem to the models (Studenmund, 2014). The correlation matrix confirms this impression.

5. Empirical results

5.1 Summary statistics

Table (2) reports descriptive statistics for our sample firms. Panel A and B summarise the pre-crisis and crisis period, respectively, and panel C presents t-tests for differences of means between the two periods. The table shows that the oil price crisis affected important firm characteristics. Mean total assets increased from 31,115 million NOK before the crisis to 38,131 million NOK after. Similarly, operating quarterly cash flow went from 1,092 MNOK to 1,135 MNOK from the pre-crisis to the crisis period. Revenue, leverage and different performance metrics, however, have decreased following the oil price drop. Unweighted ROA decreases from 0,4 % (1,7 % annually) to -2,3 % (-9 % annually). ROA weighted by firm size decreases from 1,7 % (6,8 % annually) to -1 % (-4 % annually). Mean net income after tax went from 515 million NOK to -371 million NOK. Panel C shows that the differences are significant at either the 1 % or 5 % level for net income after tax, ROA and market-to-book. The summary statistics confirm that the oil price drop had a big effect on the Norwegian listed oil companies.

[5] We ran a Hausman test (Appendix) for our panel data showing that random effects estimator was a better fit for model 1, 2 and 3 than the fixed effects estimator. The two estimation techniques give the same conclusions to our hypotheses.

Table 2: Summary statistics

Variable	Mean	Median	Std. Dev	Min	Max
Panel A: Pre-Crisis period (N = 490)					
Revenue	5533,32	245,13	27290,35	-6,58	191599,30
Total assets	31115,70	15343,66	131452,70	151,02	904701,80
Net income	515,93	16,93	2913,75	-1593,91	26868,69
Operating cash flow	1092,36	75,04	5526,65	-479,26	54074,66
ROA, unweighted	0,004	0,005	0,040	-0,279	0,224
ROA, weighted	0,017				
Market-to-book	1,07	0,85	1,26	-7,88	6,35
Leverage	0,56	0,58	0,24	0,00	1,97
Panel B: Crisis period (N=330)					
Revenue	4304,51	223,11	19837,09	-0,40	15933,00
Total assets	38131,22	4943,53	158260,50	70,42	996587,20
Net income	-371,27	-15,26	2606,18	-36828,26	6791,09
Operating cash flow	1135,27	99,44	4974,20	-624,54	47907,59
ROA, unweighted	-0,023	-0,009	0,085	-0,511	0,597
ROA, weighted	-0,01				
Market-to-book	0,71	0,49	3,31	-56,67	6,51
Leverage	0,58	0,60	0,27	0,00	1,49

Panel C: t-test for difference of means between pre-crisis and crisis period				
Variable	Mean pre-crisis	Mean crisis	Difference	t-test
Revenue	5533,32	4304,51	1228,81	0,72
Total assets	31115,70	38131,22	-7015,52	-0,70
Net income	515,93	-371,27	887,20	4,54***
Operating cash flow	1092,36	1135,27	-42,91	-0,12
ROA	0,004	-0,022	0,026	5,33***
Market-to-book	1,07	0,71	0,36	2,11**
Leverage	0,56	0,58	0,02	-0,82

Notes: Our full sample includes 34 oil and oil-related companies listed on Oslo Stock Exchange. The sample period spans from 2011 to 2016. Panel A reports the summary statistics of our sample in the pre-crisis period (2011 Q1 to 2014 Q2), and Panel B shows summary statistics of our sample for the crisis period (2014 Q3 to 2016 Q4). Panel C shows the results of t-tests for the mean value differences between the two periods; ***, ** and * indicate the significance level at 1 %, 5 % and 10 %, respectively (two-tailed). All figures above are in million NOK.

5.2 Results hypothesis 1

To test our first hypothesis, we estimate equation 1-3 for both the pre-crisis and crisis period. The results are presented in table 3. The significance testing is carried out using a bootstrapping

procedure similar to the one used by Filip and Raffournier (2014). Using 50 randomly extracted observation, we run 10 000 simulations of the respective regression models for each period. The standard deviation of the residuals from every simulation are then saved in a separate file. Finally, a t-test is used to test the difference of means between the two periods.

Table 3: Earnings management metrics for the pre-crisis and the crisis period.

Period	N	Modified Jones	Kothari	Larcker
Pre-crisis	442	0,047	0,041	0,033
Crisis	340	0,092	0,062	0,060
Difference		-0,045***	-0,022***	-0,027***
t-value		-140,00	-59,13	-140,00

Notes: Modified Jones is the ratio of the standard deviation of the residuals from the Modified Jones model developed by Dechow (1995): $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \varepsilon_{it}$ (1); Kothari is the standard deviation of the residuals from the Kothari (2005) model: $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 ROA_{it} + \varepsilon_{it}$ (2); Larcker is the standard deviation of the residuals from the Larcker (2004) model modified by Cimini (2015): $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 MB_{it} + \beta_5 OCF_{it} + \varepsilon_{it}$ (3).
All variables mentioned above are defined in section 4.3. The difference between the two periods is tested with a bootstrapping procedure, using 10 000 simulations and 100 randomly extracted observations to calculate our proxies of earnings management 10 000 times for each model. We use an independent t-test with unequal variances to test the mean difference between the periods. ***, **, and * indicate significance at the 1 %, 5 % and 10 %, respectively (two-tailed).

All three measures of earnings management display higher standard deviation of the residuals in the crisis period, meaning that there is more earnings management and lower earnings quality. The differences are significant at the 1 % level. Because every metric show the same trend, the findings seem to be robust. The two models that control for performance, Kothari (2005) and Larcker (2004), generally have higher explanatory power (Appendix) and lower standard deviation of the residuals, than the basic Modified Jones model. This is in line with the arguments of Dechow *et al*. (2012) and Kothari, Leone and Wasley (2005), and hence not surprising in a volatile environment.

The results support our first hypothesis of more earnings management after the oil price shock and provide evidence of a link between earnings management behaviour and the macroeconomic environment. Our findings are in agreement with the conclusions of Rusmin, Scully and Tower (2012), Habib, Bhuiyan and Islam (2013) and Persakis and Iatridis (2015) in the financial crisis

literature. They are also consistent with previous research on the oil industry (Han and Wang, 1998; Byard, Hossain and Mitra, 2007; Hsiao, Hu and Lin, 2016), and provide further evidence on how oil price changes affect company's inclination to engage in earnings management. They are, however, somewhat conflicting with previous studies on earnings management in a Norwegian context (Leuz, Nanda and Wysocki, 2003; Shen and Chih, 2005; Filip and Raffournier, 2014).

5.3 Results hypothesis 2

To further investigate the findings from H1, we study in which quarters and what direction companies manage earnings. Figure (2) shows the development of discretionary accruals for the complete period. The graph indicates large discretionary accruals in the two quarters immediately following the start of the crisis.

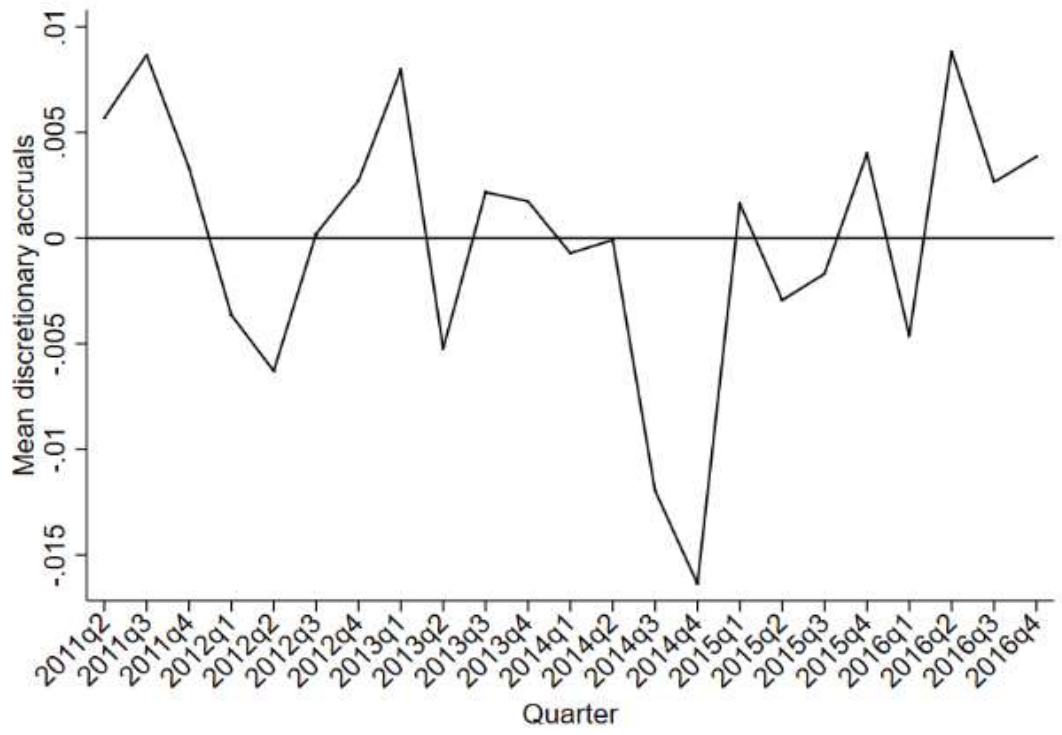

Figure 2: Mean discretionary accruals development for the estimation period

Table 4: Testing for abnormal income-decreasing total accruals for the Byard (2007) model

Variables	Coefficient estimates	Z-stat
Intercept	0,0281	2,96 ***
CRISISQ3	-0,0100	-2,20 **
CRISISQ4	-0,0158	-2,16 **
$1/A_{it-1}$	9116812	1,95 *
$\Delta REV_{it} - \Delta REC_{it}$	-0,0670	-2,88 ***
PPE_{it}	0,0135	1,40
ROA_{it}	0,9574	20,97 ***
LEV_{it}	0,0123	0,61
MB_{it}	0,0007	0,27
OCF_{it}	-0,0002	-8,30 ***
Q_2	0,0023	0,61
Q_3	0,0045	1,49
Q_4	-0,0022	-0,34
Y_{12}	-0,0053	-1,30
Y_{13}	0,0007	0,15
Y_{14}	0,0024	0,64
Y_{15}	-0,0024	-0,55
Y_{16}	-0,0023	-0,41
Model summary		
F(17,33)	218,56 ***	
R^2	0,75	
Sample size	780	

Notes: This table shows the results of equation (4) for our sample of 34 oil and oil-related companies. The equation is estimated using a fixed effects regression, where the model explains the effect of the oil price crisis on total accruals. Equation for the Byard model: $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 OCF_{it} + \beta_5 ROA_{it} + \beta_6 LEV_{it} + \beta_7 MB_{it} + \alpha_1 Q_2 + \alpha_2 Q_3 + \alpha_3 Q_4 + \gamma_1 Y_{12} + \gamma_2 Y_{13} + \gamma_3 Y_{14} + \gamma_4 Y_{15} + \gamma_5 Y_{16} + \lambda_1 CRISISQ3 + \lambda_2 CRISISQ4 + \varepsilon_{it}$ (4). The dependent variable is quarterly total accruals. The test variables are the two indicator variables, CRISISQ3 and CRISISQ4, which equals 1 for the third and fourth quarter of 2014, respectively, and zero otherwise. Remaining variables are defined in section 4.3; ***, ** and * indicate the significance level at 1 %, 5 % and 10 %, respectively (two-tailed).

The fixed effects estimation of equation (4), shown in table (4), checks the significance of these effects and verifies that both CRISISQ3 and CRISISQ4 is statistically significant, at the 5 % level. Both coefficients are negative, indicating the use of income-decreasing earnings management at the beginning of the crisis. As for Hsiao, Hu and Lin (2016), the model has a high explanatory power (0,75), meaning that the variables explain the variation in total accruals well. The rest of the variables included in the model are control variables for different firm characteristics and not central to our study.

The results support the second hypothesis and imply that managers exploit the crisis environment by engaging in earnings management practices, and more specifically the use of the big bath strategy. This is consistent with Hope and Wang (2018) who state that an adverse economic environment could lead managers to pack negative surprises in the current financial statement to enhance future periods earnings. Our results find empirical support in Rusmin, Scully and Tower (2012) who report that Asian transportation firms made poor results even worse during the global financial crisis. By reviewing the graph and testing different quarter dummy variables, there are no signs of further income-decreasing earnings management in the rest of the crisis period, despite 2015 and 2016 being difficult years for the industry. This is expected from big bath accounting choices. In future periods, as the oil price recovers, we anticipate positive discretionary accruals.

6. Conclusion

The aim of this thesis was to investigate whether and how accounting choices in the oil companies listed on the Oslo Stock Exchange changed in response to the oil price shock of 2014. Through statistical analysis, we find more earnings management in the crisis period compared to the preceding period. More specifically, by taking advantage of the uncertain macroeconomic environment, companies booked large income-decreasing accruals during the third and fourth quarter of 2014. We attribute these findings to the big bath strategy.

This paper supports the studies that find downward earnings management in times of crisis (Saleh and Ahmed, 2005; Rusmin, Scully and Tower, 2012). It contradicts other studies that find more accurate financial reporting during an economic downturn (Filip and Raffournier, 2014; Arthur, Tang and Lin, 2015). Less earnings management is often explained with increasing conservativeness and scrutiny by stakeholders such as regulators and auditors. Despite having a severe impact, the scope of our event is smaller and may not induce the same level of scrutiny. Another potential reason is that while most previous research is conducted on the economy as a whole, and often across several countries, this study focuses on the presumably most affected industry. Although our sample is not entirely homogenous, the impact and incentives will be more alike than for many previous studies.

This thesis also makes contributions to the literature on earnings management in the oil industry and the literature in a Norwegian context. While earlier research study the oil industry after positive oil price shocks, we fill a gap by studying the effect of a negative oil price drop on earnings management. Both events lead to income-decreasing accounting choices, but Han and Wang (1998) and Byard, Hossain and Mitra (2007) attribute their findings to another theory, the political cost hypothesis. Further, the results supplement the limited literature on earnings management and economic shocks in a Norwegian setting.

Our findings have valuable implications for stakeholders in the oil industry. This study's findings, combined with prior research, indicate that investors need to be alert both in good and bad times. In addition, big bath accounting choices impact future accounting periods. Undervalued assets give lower accruals and overstated earnings in the subsequent periods. If investors and other stakeholders are unaware of this practice, company stock prices will become overvalued.

Like any other empirical research, our study is not without certain limitations. We rely on proxy measures for earnings management, meaning that we cannot rule out whether our findings are subject to more natural explanations like the conservatism principle, rather than earnings management. Even though erroneous conclusions due to model shortcomings cannot be ruled out, we believe that using four different models strengthens the reliability of the findings. Lastly, the relatively small sample size may affect the results, and as we only focus on companies listed on the Oslo Stock Exchange, the external validity of the findings is constrained.

Future research may examine whether our findings are comparable to the oil industry in other countries, particularly in European countries and in America. It would also be interesting to investigate accounting choices in the oil industry as the oil price recovers. In the last decade, neural networks techniques have shown promising capabilities to detect earnings management (Höglund, 2012; Namazi and Maharluie, 2015). Future researchers may explore if these detection techniques yield the same results.

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Appendix

Table A1: Definitions of the variables applied

TA_{it}	total accruals, computed as net income after tax – operating cash flow, deflated by lagged total assets for company i in quarter t
A_{it-1}	lagged total assets for company i in quarter t
ΔREV_{it}	change in total sales deflated by lagged total assets for company i in quarter t
ΔREC_{it}	change in account receivables deflated by total assets for company i in quarter t
PPE_{it}	net value of property, plant and equipment deflated by lagged total assets for company i in quarter t
ROA_{it}	net income after tax deflated by lagged total assets for company i in quarter t
MB_{it}	is the market-to-book ratio (i.e. market value to book value of equity) for company i in quarter t
OCF_{it}	operating cash flow for company i in quarter t
LEV_{it}	leverage for company i in quarter t, calculated as total liability deflated by lagged total assets
Q_j	indicator variable, which equals to 1 for fiscal quarter j (j = 2, 3 or 4), and zero otherwise
Y_k	indicator variable, which equals to 1 for fiscal year k (k = 2012, 2013, 2014, 2015, 2016), and zero otherwise
CRISISQ3	dummy variable equal to 1 for the third quarter of 2014 and zero otherwise.
CRISISQ4	dummy variable equal to 1 for the fourth quarter of 2014 and zero otherwise

Table A2: Modified Jones model developed by Dechow, Sloan and Sweeney (1995)

	Pre-crisis		Crisis	
Variables	Coefficients	z-value	Coefficients	z-value
Constant	-0,029	-2,67***	-0,068	-5,18***
$1/A_{it-1}$	5 117 414	1,37	11 100 000	6,40***
ΔREV_{it}-ΔREC_{it}	-0,150	-2,71***	-0,252	-1,54
PPE_{it}	0,011	0,80	0,027	1,46
Model statistics				
R^2	0,04		0,11	
N	442		340	
Wald chi2	10,27***		80,28***	

Notes: The equation for the Modified Jones developed by Dechow, Sloan and Sweeney: $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \varepsilon_{it}$ (1).

Table A3: Hausman test Modified Jones (1995) model

	Pre-crisis	Crisis
Prob>chi2	0,861	0,232

Notes: Test of H_0: difference in coefficients not systematic. The random effects estimator is chosen if the p-value is > 0,05.

Table A4: Kothari et al. (2005) model

	Pre-crisis		Crisis	
Variables	Coefficients	z-value	Coefficients	z-value
Constant	-0,029	-2,65***	-0,039	-2.70***
$1/A_{it-1}$	10 200 000	1,37	11 100 000	5,14***
ΔREV_{it}-ΔREC_{it}	-0,147	-3,54***	-0,252	-1,35
PPE_{it}	0,012	0,83	0,027	0,72
ROA_{it}	0,828	5,81***	1,002	8,71***
Model statistics				
R^2	0,01		0,42	
N	442		340	
Wald chi2	67,73***		251,78 ***	

Notes: The equation for the Kothari model: $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 ROA_{it} + \varepsilon_{it}$ (2).

Table A5: Hausman test for Kothari (2005) model

	Pre-crisis	Crisis
Prob>chi2	0,713	0,192

Notes: Test of H_0: difference in coefficients not systematic. The random effects estimator is chosen if the p-value is > 0,05.

Table A6: Larcker and Richardson (2004) model modified by Cimini (2015)

	Pre-crisis		Crisis	
Variables	Coefficients	z-value	Coefficients	z-value
Constant	-0,002	-0,24	-0,038	-2,84***
$1/A_{it-1}$	-4 443 244	-1,60	3 224 299	1,72*
ΔREV_{it}-ΔREC_{it}	-0,012	-0,28	-0,135	-1,46
PPE_{it}	0,008	0,71	0,020	1,18
MB_{it}	0,003	0,80	0,003	0,59
OCF_{it}	-0,091	12,47***	-0,884	-7,36***
Model statistics				
R^2	0,54		0,233	
N	440		340	
Wald chi2	175,47***		146,05***	

Notes: The equation for the Larcker model modified by Cimini (2015: $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 MB_{it} + \beta_5 OCF_{it} + \varepsilon_{it}$ (3).

Table A7: Hausman test for Larcker (2004) model

	Pre-crisis	Crisis
Prob>chi2	0,363	0,088

Notes: Test of H_0: difference in coefficients not systematic. The random effects estimator is chosen if the p-value is > 0,05.

Table A8: Hausman test for Byard (2007) model

	2011-2016
Prob>chi2	0,0053

Notes: Test of H_0: difference in coefficients not systematic. The random effects estimator is chosen if the p-value is > 0,05.

Table A9: Correlation matrix

	TA_{it}	$1/A_{it-1}$	ΔREV_{it}-ΔREC_{it}	PPE_{it}	LEV_{it}	ROA_{it}	MB_{it}	OCF_{it}	CRISIS Q3	CRISIS Q4
TA_{it}	1,000									
$1/A_{it-1}$	0,103	1,000								
ΔREV_{it}-ΔREC_{it}	-0,127	0,012	1,000							
PPE_{it}	0,030	-0,418	0,001	1,000						
LEV_{it}	-0,076	-0,254	-0,006	0,455	1,000					
ROA_{it}	0,614	-0,105	-0,033	0,068	-0,120	1,000				
MB_{it}	0,033	0,067	0,023	-0,255	-0,255	0,138	1,000			
OCF_{it}	-0,493	-0,304	0,079	0,114	0,085	0,177	0,101	1,000		
CRISISQ3	-0,018	-0,000	-0,033	-0,005	-0,026	0,009	-0,015	0,029	1,000	
CRISISQ4	-0,215	-0,002	0,057	0,015	0,010	-0,148	-0,053	0,096	-0,046	1,000

Notes: According to Studenmund (2014), a correlation between two variables above 0,80 is considered as high.

Table A10: Variance Inflation Factors

Variable	VIF	1/VIF
$1/A_{it-1}$	1,33	0,751
ΔREV_{it}-ΔREC_{it}	1,01	0,986
PPE_{it}	1,50	0,665
LEV_{it}	1,34	0,744
ROA_{it}	1,12	0,894
MB_{it}	1,14	0,877
OCF_{it}	1,18	0,850
CRISISQ3	1,01	0,994
CRISISQ4	1,05	0,955
Mean VIF	1,19	

Notes: According to Studenmund (2014), a common rule of thumb for the VIFs is $VIF(\beta_i) > 5$, indicates severe multicollinearity.