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Accrual earnings management in response to an oil price shock

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ABSTRACT

The aim of this study was to examine the relationship between the oil price shock of 2014 and earnings management of oil companies listed on the Oslo Stock Exchange. The results revealed a significant increase in earnings management following the oil price drop. Moreover, we found that companies adjusted their earnings and abnormal income-decreasing accruals were identified during the third and fourth quarters of 2014. We attribute this finding to the big bath strategy. The contribution of this study promotes the understanding of the effect of macroeconomic shocks on earnings management behaviour, and it supplements and expands the earnings management literature in this homogenous industry.

1. Introduction

The oil price drop of 2014 sent shock waves throughout the oil industry. From June 2014 to January 2015, the price of Brent Crude dropped from approximately $115 to $46 per barrel. This dramatic drop was primarily attributed to the United States increased shale oil production and OPEC's decision to maintain their level of production based on the rationale that low oil prices offer more long-term benefits than if they were to give up market shares (McCain, 2015). In turbulent times, the reliability of financial statements is particularly essential to stakeholders. However, information asymmetry between preparers and users of financial information makes opportunistic altering possible, which reduces the quality of financial reporting (Arthur et al., 2015). Basu et al. (2013) stated 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 critically valuable to all users of this type of financial information.

Earnings management literature has traditionally focused on the determinants and consequences of financial information manipulation, while holding the macroeconomic environment constant or assuming that it does not have an impact. In the post financial crisis era, this assumption has been challenged. Empirical research has indicated that dramatic changes in the economic climate influence the propensity of companies to manage earnings, but it provides no consensus on how or in what direction that management occurs. Intuitively, downturns do not have the same impact on every industry, and hence, they have the potential to result in contrasting incentives. The aim of our study focused on the industry hardest hit by the oil price drop of 2014, and we assert that reporting incentives should be more similar and homogenous than they are in most other earnings management studies. Norway is a promising empirical setting because the Oslo Stock Exchange has a particularly significant exposure to oil prices (Næs et al., 2009). Hence, the aim of this study also included an examination of accounting choices of oil companies listed on the Oslo Stock Exchange as they responded to the oil price shock of 2014.

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[1] Oil price shock of 2014 is defined as a crisis in the oil industry.

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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 creates incentives to take fewer risks and produce more accurate financial statements. Conversely, volatile environments may 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, whereby companies make poor results worse and thus enhance the following year's earnings as the accruals reverse. The empirical evidence is inconclusive as to how macroeconomic crises affect earnings management behaviour. While most studies have found an effect, there is no consensus on the direction of the effect (Rusmin et al., 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 has been conducted regarding this event. While previous events are analogous, important differences exist. First, the financial crisis literature has investigated virtually all sectors of the economy. By analysing the oil industry independently, it was possible to isolate the response to a dramatic change in output price for the most affected companies. In addition, 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. The purpose of this paper is to fill these gaps and provide valuable insights for users of financial statements.

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

The remainder of this paper is organised in the following manner. Section 2 discusses the relevant previous literature. Section 3 provides the theoretical development of the hypotheses, which is followed by an analysis of the dataset and discussion of the research design in section 4. Section 5 presents the empirical results, and section 6 concludes the study by presenting 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 distinct methods used to alter financial reporting. Accrual-based earnings management occurs when management opportunistically applies accounting standards to manage earnings in a desired direction. Real activities manipulation occurs when management changes 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 comprehensive survey, Graham et al. (2005) found that both techniques are used to manipulate earnings. Our study focused on accrual earnings management (due to data access).

A majority of previous papers evaluated different incentives for earnings management. These incentives were categorised by Fields et al. (2001) into three main groups, including contractual arrangements, asset pricing and third-party decisions. Examples of these incentives for earnings management include managers' bonus schemes, tax reductions, management buyouts, IPO's and meeting or exceeding analysts' expectations.[2] Studies has also indicated that a common characteristic of incentives is that they hold the macroeconomic environment constant. Macroeconomic events, however, could work as incentives themselves. Healy (1985, p. 86) stated, "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 big baths are used as an earnings management technique, they erode the information climate and obscure operating performance. However, if the asset market value is less than the book value, write-downs can improve the information environment and reduce information asymmetry (Hope and Wang, 2018).

Leuz et al. (2003) investigated earnings management in different countries and found that the level of investor protection strongly affects earnings management behaviour and that Norway is among the countries with the lowest degree of earnings management. Filip and Raffournier (2014) found that although Norwegian companies follow the same pattern as most other European countries, they engaged in less earnings management following the financial crisis of 2008.

Empirical research on the effect of different economic environments is ambiguous. Agarwal et al. (2007) studied Japanese banks in the context of three distinct economic environments, including 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 periods of recession. Similarly, Jenkins et al. (2009) reported 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. Ze-To (2012),

[2] Managers' bonus schemes (Healy, 1985; Holthausen et al., 1995; Gaver et al., 1995), tax reductions (Burgstahler and Dichev, 1997; Tao, 2014), management buyouts (Perry and Williams, 1994; Mao and Renneboog, 2015), IPOs (Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995; Teoh et al., 1998), meeting or exceeding analysts' expectations (Degeorge et al., 1999; Bartov et al., 2002; Yu, 2008).

which examined companies on the NYSE and AMEX markets for the period 1989 to 2007, presented contrary findings. His evidence suggested that firms manage earnings in states of both economic growth and recession.

Although no prior literature exists regarding 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, were similar in that they represented major negative shocks to the economy. This study provides indications about what to expect from earnings management activity following an oil price shock. Davis-Friday and Gordon (2005) found that the value relevance of earnings did not decline during the Mexican currency crisis. However, by contrast, Graham et al. (2000) and Ho et al. (2001) stated that earnings relevance decreased during the Asian financial crisis. Ahmad-Zaluki et al. (2011) identified more income-increasing earnings management for IPO firms during the Asian financial crisis, while in the context of the Malaysian financial crisis, Saleh and Ahmed (2005) found income-decreasing earnings management by financially distressed firms. Miranda-Lopez and Valdovinos-Hernandez (2019) found evidence indicating that listed companies were involved in a significant increase of income smoothing during the global economic crisis in Mexico's developing economy.

The global financial crisis of 2008 is arguably most comparable to the oil shock crisis of 2014 since it is the most recent, and the majority of the research has been conducted in the European settings. Numerous studies have examined the effects of the 2008 crisis on financial reporting choices. For example, Persakis and Iatridis (2015) investigated the impact of the global financial crisis on earnings quality in publicly listed firms in advanced countries with respect to the level of investor protection. Their results indicated that earnings decreased during the financial crisis, especially in those countries characterised by medium and weak shareholder protection. In a study of Asian transportation firms, Rusmin et al. (2012) found both the adoption of smoothing behaviour in seven Asian countries and empirical evidence that suggested corporate managers opportunistically smoothed income to exceed earnings targets and engage in big bath practises. Habib et al. (2013) investigated the earnings management practices by financially distressed firms and examined whether these practices changed during the financial crisis. The results indicated that managers of troubled firms tended to engage in more income-decreasing earnings management compared to managers of healthy firm counterparts.

The literature is, however, conflicting. Filip and Raffournier (2014) concluded that there is a significant decrease in income smoothing and improved accruals quality during the crisis period. This trend was confirmed for most of the 16 EU countries under review. Furthermore, similar findings were reported by Kousenidis et al. (2013), who examine whether and to what extent the financial crisis of 2008 impacted the quality of the reported earnings of firms listed in EU countries with weak fiscal sustainability. The results revealed that, on average, earnings quality improved during the financial crisis. Arthur et al. (2015) compared the earnings quality of firms in 14 European countries during the period from 2005 to 2007 and during the financial crisis period from 2008 to 2010. The results indicated that firms tended to present higher-quality financial reports during the financial crisis than they did prior to the crisis. Cimini (2015) presented similar findings in a study of non-financial entities listed in EU countries.

Differences in the research design may explain, at last in part, why the crisis literature has been relatively inconclusive. Some studies have taken a country-by-country approach (Persakis and Iatridis, 2015), while others merge all countries into the same sample (Arthur et al., 2015). Differences in reporting on culture, investor protection and economic environment may affect how a crisis changes earnings management behaviour, and accordingly, these differences may lead to conflicting results. Moreover, most event studies have considered the entire economy. As mentioned, because downturns do not have the same impact regardless of industry, these downturns could result in contrasting incentives. Thus, this study focused on the industry that were most vulnerable to the oil price drop of 2014. The reporting incentives should be more homogenous compared to the majority of similar studies.

Most previous studies on the oil industry examined the effect of a positive change in oil prices. Studies on the Persian Gulf crisis (Han and Wang, 1998), on hurricanes Katrina and Rita (Byard et al., 2007) and on the Arab Spring (Hsiao et al., 2016) point to income-decreasing earnings management following the respective shocks. Byard et al. (2007) and Han and Wang (1998) attributed their findings to the political cost hypothesis (Watts and Zimmerman, 1986), while the findings of Hsiao et al. (2016) suggested that other incentives, such as income smoothing, may exist. Cormier and Magnan (2002) studied Canadian oil and gas firms over the 12-year period from 1985 to 1996, with no connection to any particular event, and they found evidence of systematic earnings management. These studies signalled that oil companies are willing to engage in earnings management, but there is a gap in the literature regarding how these companies would react to an oil price drop.

3. Hypothesis development

Intuition and research on comparable crises offer conflicting guidance regarding what to expect with respect to accounting choices made by oil companies listed on the Oslo Stock Exchange in response to the crisis. Solid intuitive arguments support improved quality of financial reporting during an economic recession. Because investors already expect the performance to be weak, the consequences of delivering negative financial data decrease, and similarly, the incentives to artificially inflate earnings also 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 the risk of litigation increase. This development could result in a greater tendency to issue qualified audit reports (Xu et al., 2013).

Despite having incentives for less earnings management during a crisis, some research has also pointed in an opposite direction. For instance, during periods of financial distress, information asymmetry increases, which is a phenomenon that provides managers better opportunities and incentives to exercise accounting discretion (Liao et al., 2013). Moreover, when operational performance is expected to be low, managers have an opportunity to clean up their accounts by engaging in big bath practices (Saleh and Ahmed, 2005). Other evidence has also suggested that managers of financially distressed firms engage in income-increasing earnings management activities to avoid debt covenant violations or IPOs (Sweeney, 1994; Ahmad-Zaluki et al., 2011; Anand, 2013). Most importantly, prior studies on oil price increases have reported that the oil industry has taken advantage of volatile environments to exercise their discretion over the

accrual process (Han and Wang, 1998; Byard et al., 2007; Hsiao et al., 2016), which provides a reason to suspect that similar decisions are made during periods of crisis.

We assess the arguments for more earnings management to dominate. Hence, based on these arguments, the following hypothesis was developed:

H1. Oslo Stock Exchange listed companies in the oil industry engage in more earnings management during an oil price crisis than they do during the period preceding the crisis.

If there is more earnings management during the crisis period, it may take the form of either income-decreasing or income-increasing accounting choices. Income-increasing choices can be rational during an oil price crisis when several companies are struggling to achieve profitability. By managing earnings upwards, it is possible for the company to give the impression that they are able to cope with the crisis better than their competitors. Moreover, Degeorge et al. (1999) highlighted the importance of meeting or exceed the results of the prior year and avoiding negative results. The empirical evidence also suggests that managers of financially distressed firms may have an increased tendency towards income-increasing choices (DeFond and Jiambalvo, 1994; Sweeney, 1994; Smith et al., 2001; Anand, 2013). In a relevant event study, Ahmad-Zaluki et al. (2011) found evidence of income-increasing earnings management during the Asian financial crisis.

Nevertheless, the use of income-decreasing earnings management may be a rational response to an oil price drop. For managers of companies with substantial debt, a decrease in earnings could lead to benefits in debt renegotiations. With respect to the financial crisis in Malaysia, Saleh and Ahmed (2005) found an extensive use of negative discretionary accruals for financially distressed firms. They attributed this to the paradox that such firms hold better cards in restructuring negotiations. Furthermore, another reason for downward earnings management during a crisis is to establish a buffer for the future (Ghazali et al., 2015). Because stakeholders already expect the operational performance to be low, managers can blame the current low earnings on the economic environment. The firm can then report better results in the aftermath of the crisis as the accruals reverse. Specifically, Rusmin et al. (2012) reported evidence of such big bath behaviour in their study of Asian transportation firms during the Asian financial crisis.

We expected managers to have incentives for downward earnings management, especially big bath accounting choices, which are more dominate than the incentives for upward earnings management (if the earning management was upward, one would still expect that the return would not reach an acceptable level). However, considering that accruals reverse, this strategy is difficult to use for several consecutive periods, and therefore, we predicted that the strategy will be most prevalent at the onset of the crisis. This led to our second hypothesis:

H2. Oil companies listed on the Oslo Stock Exchange engaged in income-decreasing earnings management in the third and fourth quarters of 2014.

4. Sample selection and research design

4.1. Event period

Identification of the event period and the preceding period is necessary to conduct an 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 decreased from more than $110 to less than $50, the largest drop since 2008. The fourth quarter of 2016 marked the end of the crisis period as companies on the Oslo Stock Exchange were no longer required to report quarterly financial statements, effective beginning in January 2017 (Børs, 2016). Hence, two competing considerations come into play when deciding the length of the preceding period. While we wanted as many observations

Fig. 1. Daily Brent Crude Oil Spot Price Per Barrel, January 2010–December 2017 extracted from Thomson Reuters.

as possible to increase the power of the statistical techniques, it is also preferred that stable oil prices characterised the baseline period. Accordingly, we selected the first quarter of 2011 as a compromise. After recovering from the dramatic decrease caused by the financial crisis of 2008, oil prices were relatively stable during this period, as shown in Fig. 1.

4.2. Data and sample selection

Our initial dataset consisted of quarterly financial statements from 54 companies listed on the Oslo Stock Exchange's 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 that dealt with natural gas. To increase comparability between the two periods, we deleted companies with unavailable data for the research period.[3] For the same purpose, we excluded companies not reporting according to the International Financial Reporting Standards (IFRS). Since GAAP (Generally accepted accounting principles) allow for less managerial discretion (Evans et al., 2014), including such companies could distort our data. Three companies were added to our initial sample because they were listed in our research period, though they were delisted prior to the data extraction. Every variable was deflated with lagged total assets to mitigate problems related to heteroscedasticity, thus resulting in the loss of 31 observations. Our final sample consisted of 34 companies and 782 firm-quarter observations. Ideally, a larger sample would have been preferred, but similar sample sizes have been used in comparable studies (Cormier and Magnan, 2002; Byard et al., 2007; Hsiao et al., 2016).

Similar to Byard et al. (2007) and Hsiao et al. (2016), we used data from quarterly reports for the analysis. Quarterly data provides a sharper focus on the event by catching more of the fluctuations in earnings, which, in turn, increases the likelihood of detecting earnings management. Moreover, most of the financial statements for the interim quarters were unaudited, which allows greater managerial discretion and requires less detailed disclosure than do annual financial statements (Jeter and Shivakumar, 1999).

4.3. Measurement of earnings management

To test our hypotheses, we employed different discretionary accrual models that are well-established in the literature. The intuition behind these regression models is that accruals that are not explained by specific firm characteristics are discretionary accruals, which could be due to 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 et al., 2010; Gerakos, 2012). Correlations between the proxy of earnings management and total accruals, correlated omitted variables and model misspecification can lead to both false positives and false negatives.

With respect to H1, we attempted to mitigate these problems by using three different models, namely, the modified Jones model (Dechow et al., 1995), the Kothari, Leone and Wasley model Kothari et al. (2005) and the Larcker and Richardson model modified by Cimini (2015). The first two models are conventional in the earnings management literature, while Cimini's model was applied in a relevant financial crisis study. If the different models yield 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 1% tails.[4] To test H1, we used the three models for both the pre-crisis and crisis period, and afterwards, we tested the difference between the two periods.

The first metric of earnings management is the modified Jones model developed by Dechow et al. (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, respectively. 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) argued that large discretionary accruals do not necessarily translate to poor accrual quality, providing the level is consistently high and, thus, predictable. Large standard deviations, however, indicate low accrual quality and more earnings management. Accordingly, the standard deviation of the residuals is our measure of earnings management.

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

where TA_{it} is 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} is lagged total assets for company i in quarter t; ΔREV_{it} is change in total sales deflated by lagged total assets for company i in quarter t; ΔREC_{it} is change in account receivables deflated by total assets for company i in quarter t; and PPE_{it} is net value of property, plant and equipment deflated by lagged total assets for company i in quarter t.

The second model was developed by Kothari et al. (2005), who expanded the modified Jones model by adding return on assets as an additional variable. Kothari et al. (2005) argued that both economic intuition and empirical evidence suggest that accruals correlate with a firm's present and past performances. By including ROA in the model, the impact of firm performance on unexpected accruals can be controlled. The standard deviation of the residuals from equation (2) represents the proxy of earnings management. With respect to the modified Jones model, a low standard deviation of the residuals indicates higher accrual quality.

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

[3] We manually added data for companies lacking certain posts based on published quarterly reports.

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

where the new variable ROA_{it} are defined as net income after tax deflated by lagged total assets for company i in quarter t. The remaining variables in equation (2) have been previously defined.

Cimini (2015) modification of the Larcker and Richardson (2004) model uses 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) argued that the discretionary accruals models are not properly specified 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.

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

where MB_{it} is market-to-book ratio (i.e., market value to book value of equity) for company i in quarter t; and OCF_{it} is operating cash flow for company i in quarter t. The remaining variables in equation (3) have been previously defined.

H2 was tested with a methodology used in previous studies on earnings management in the American oil industry (Han and Wang, 1998; Byard et al., 2007; Hsiao et al., 2016). In equation (4), CRISISQ3 and CRISISQ4 are dummy variables that equal 1 for the third and fourth quarters 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 quarters of 2014. Earlier studies have suggested that firms book more accruals in the last quarter of the year (Das et al., 2009). Therefore, quarterly dummies for Q2, Q3 and Q4 were implemented to avoid attributing this effect to the crisis period variables. Because the second hypothesis predicts income-decreasing earnings management during the crisis, the two crisis variables are expected to have a negative sign.

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

where LEV_{it} is leverage for company i in quarter t, calculated as total liability deflated by lagged total assets; Q_j is an indicator variable, which equals 1 for fiscal quarter j (j = 2, 3 or 4), and zero otherwise; Y_k is an indicator variable, which equals 1 for fiscal year k (k = 2012, 2013, 2014, 2015, 2016), and zero otherwise; CRISISQ3 is a dummy variable equal to 1 for the third quarter of 2014, and zero otherwise; and CRISISQ4 is a dummy variable equal to 1 for the fourth quarter of 2014, and zero otherwise. The remaining variables in equation (4) have been previously defined.

We initially estimated equations (1)–(4) using the ordinary least squares (OLS) method. An additional analysis of the residuals from these estimations displayed significant first and fourth order autocorrelation and heteroscedasticity. To adjust for this distortion, equations (1)–(3) were used to conduct a random effects panel data regression with robust standard errors. Equation (4) was used to estimate a fixed effects regression with robust standard errors.[5] A high correlation between independent variables may lead to imprecise results, and thus, we performed 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 were found to be below 5, indicating that multicollinearity was not a problem in the models. The correlation matrix confirmed this conclusion (see Table 1).

5. Empirical results

5.1. Summary statistics

Table 2 presents the descriptive statistics for our sample firms. Panels A and B summarise the pre-crisis and crisis periods, respectively, and panel C presents t-tests for differences of means between the two periods. The table further indicates that the oil price crisis affected important firm characteristics. For example, mean total assets increased from 31 115 MNOK before the crisis to 38 131 MNOK after. Similarly, operating quarterly cash flow increased from 1092 MNOK to 1135 MNOK from the pre-crisis period to the crisis period. However, revenue, leverage and different performance metrics decreased following the oil price drop. Similarly, the unweighted ROA decreased from 0.4% (1.7% annually) to −2.3% (−9% annually), and ROA weighted by firm size decreased from 1.7% (6.8% annually) to −1% (−4% annually). The mean net income after taxes declined from 515 MNOK to −371 MNOK. Panel C indicates that the differences are significant at either the 1% or 5% level for net income after taxes, ROA and market-to-book. Accordingly, the summary statistics confirmed that the oil price drop had a major effect on the Norwegian listed oil companies.

5.2. Results hypothesis 1

To test our first hypothesis, equations (1)–(3) were used for both the pre-crisis and crisis period. The results are presented in Table 3. The significance testing was conducted using a bootstrapping procedure like the one used by Filip and Raffournier (2014). Using 50 randomly extracted observation, 10 000 simulations of the respective regression models were performed for each period. The standard deviations of the residuals from every simulation were then saved in a separate file. Finally, a t-test was used to test the difference of the means between the two periods.

[5] A Hausman test (see Appendix) was employed for our panel data, which showed that a random effects estimator was a better fit for models 1, 2 and 3 than the fixed effects estimator. The two estimation techniques provided the same conclusions with respect to our hypotheses.

Table 1
Sample selection of the companies included in the study.

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 lack of data	336
- Observations lost due to requirement of lagged total assets	31
+ Additional firm quarter observations added to sample	69
= Final sample	782

Table 2
Descriptive statistics for the sample firms.

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

All three measures of earnings management display higher standard deviations of the residuals for the crisis period, thus suggesting there was an increase in earnings management and a decrease in earnings quality. The differences were significant at the 1% level. Because every metric reveals the same trend, the findings appear robust. The two models that control for performance, Kothari et al. (2005) and Larcker and Richardson (2004), generally have higher explanatory power (see Appendix) and lower standard deviations with respect to the residuals than does the basic modified Jones model. This is consistent with the arguments of Dechow et al. (2012) and Kothari et al. (2005), and hence, they are not surprising in a volatile environment.

The results supported our first hypothesis that there is increased earnings management after the oil price shock and provided plausible evidence of a link between earnings management behaviour and the macroeconomic environment. Our findings agreed with the conclusions of Rusmin et al. (2012), Habib et al. (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 et al., 2007; Hsiao et al., 2016), and they provided further evidence regarding how oil price changes affect a company's inclination to engage in earnings management. That said, our findings somewhat conflicted with previous studies on earnings management in a Norwegian context, but without the industry-specific focus (Leuz et al., 2003; Filip and Raffournier, 2014).

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

Period	N	Modified Jones	Kothari	Larcker and Richardson
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 et al. (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 et al. (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 and Richardson is the standard deviation of the residuals from the Larcker and Richardson (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 was 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 used an independent t-test with unequal variances to test the mean difference between the periods, and ***, **, and * indicate significance at the 1%, 5% and 10%, respectively (two-tailed).

5.3. Results hypothesis 2

To further investigate the findings from H1, we identified the in which quarters and in what direction companies manage earnings. Fig. 2 presents the development of discretionary accruals for the entire period. The graph indicates large discretionary accruals in the two quarters immediately following the onset of the crisis.

The fixed effects estimation in equation (4), as shown in Table 4, was employed to check the significance of these effects and verify that both CRISISQ3 and CRISISQ4 were statistically significant at the 5% level. Moreover, both coefficients were negative, indicating the use of income-decreasing earnings management at the beginning of the crisis. For Hsiao et al. (2016), the model has a high explanatory power (0.75), which indicates that the variables explain the variation in total accruals well. The remaining variables included in the model were control variables for different firm characteristics and were not central to our study.

The results supported 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 stated that an adverse economic environment could lead managers to pack negative surprises in the current financial statement to enhance earnings in future periods. Our results provided empirical support for Rusmin et al. (2012), who report that Asian transportation firms made poor results that were even worse during the global financial crisis. By reviewing the graph and testing different quarter dummy variables, no signs of further income-decreasing earnings management were found during 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 and policy implications

The aim of this study was to investigate whether and how accounting choices by the oil companies listed on the Oslo Stock Exchange changed in response to the oil price shock of 2014. Through statistical analysis, we found that more accrual earnings management occurred during the crisis period than during the period preceding the crisis. More specifically, by taking advantage of the uncertain macroeconomic environment, companies booked large income-decreasing accruals during the third and fourth quarters of 2014. We attributed these events to the use of a big bath strategy.

This paper supports the studies that have reported downward earnings management in times of crisis (Saleh and Ahmed, 2005; Rusmin et al., 2012). However, it contradicts those studies that found more accurate financial reporting during an economic downturn (Filip and Raffournier, 2014; Arthur et al., 2015). Less earnings management has often been explained by increasing conservativeness and scrutiny by stakeholders, such as regulators and auditors. Despite having a severe impact, the scope of our event was smaller and

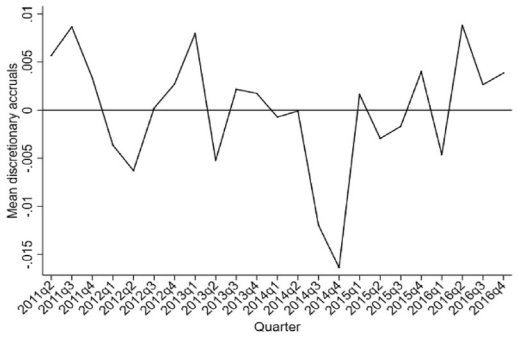

Fig. 2. Mean discretionary accruals development for the estimation period.

Table 4
Testing for abnormal income-decreasing total accruals using the Byard et al. (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*
ΔREV_{it} - ΔREC_{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. The equation for the Byard model is $TA_{it} = \beta_0 + \beta_1(1/A_{it-1}) + \beta_2(\Delta REV_{it} - \Delta REC_{it}) + \beta_3 PPE_{it} + \beta_4 OCF_{it} + \beta_5 ROA_{it} + \beta_6 LEV_{it} + \beta_7 MB_{it} + \alpha_1 Q_2 + \alpha_2 Q_3 + \alpha_3 Q_4 + \gamma_1 Y_{12} + \gamma_2 Y_{13} + \gamma_3 Y_{14} + \gamma_4 Y_{15} + \gamma_5 Y_{16} + \lambda_1 CRISISQ3 + \lambda_2 CRISISQ4 + \varepsilon_{it}$ (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 quarters of 2014, respectively, and zero otherwise. The remaining variables are defined in section 4.3, while ***, ** and * indicate significance levels of 1%, 5% and 10%, respectively (two-tailed).

may not be expected to induce the same level of scrutiny.

Another potential reason is that while most previous research has been conducted on the economy as a whole and often across several countries, this study focused on the presumably most affected industry. Although our sample was not entirely homogenous, the impact and incentives were more similar than those of many previous studies.

This study contributes to the literature on earnings management in the oil industry. While earlier studies examined the oil industry after positive oil price shocks, this study helps to fill a gap by studying the effect of a negative oil price drop on earnings management. Although both events led to income-decreasing accounting choices, Han and Wang (1998) and Byard et al. (2007) attributed this phenomenon and their findings to another theory (i.e., the political cost hypothesis).

Our findings have valuable implications for stakeholders in the oil industry. A combination of this study's findings and prior research indicates that investors should always be alert, i.e., in both good times and bad. In addition, big bath accounting choices impact future accounting periods, such that undervalued assets give lower accruals and overstate earnings in subsequent periods. If investors and other stakeholders are unaware of this practice, company stock prices may become overvalued.

Our study is not without certain limitations. First, we omitted variables related to governance. Moreover, we relied on proxy measures for earnings management, meaning that we cannot rule out whether our findings are subject to more natural explanations, such as 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. Finally, the relatively small sample size may affect the results, and because we only focus on companies listed on the Oslo Stock Exchange, the external validity of the findings is somewhat constrained.

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

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Appendix A

Table A1
Definitions of applied variables

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}	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 and calculated as total liability deflated by lagged total assets
Q_j	indicator variable, which equals 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 et al. (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 (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).

Table A3
Hausman test modified Jones model

	Pre-crisis	Crisis
Prob > chi2	0.861	0.232

Notes: Test of H_0: difference in coefficients not systematic. The random effects estimator was chosen if the p-value was >0.05.

Table A4
Kothari et al. (2005) model

x	Pre-crisis		Crisis	
	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 et al. (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 was chosen if the p-value was >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 and Richardson 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 and Richardson (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 was chosen if the p-value is > 0.05.

Table A8
Hausman test for the Byard et al. (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

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

(*continued on next page*)

Table A10 (*continued*)

Variable	VIF	1/VIF
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	

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