Norwegian School of Economics
Bergen, Autumn 2018

Changes in the Value Relevance of Accounting Information Over Time After the Transition to IFRS

Evidence from Norway

Amalie Ekker Bartnes and Siril Utheim Grønvik

Supervisor: Kjell Henry Knivsflå

Master thesis, Accounting and Finance

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

We have used a sample of 212 firms, 1640 firm-year observations, listed on Oslo Stock Exchange over the time period 2005-2017 to analyze whether the value relevance of accounting information has increased over time after the transition to International Financial Reporting Standard (IFRS). To analyze the changes in value relevance, we have used a price regression model and time regression models, which are central value relevance regression models. By running the price regression model, we obtained value relevance measurements entering in the time regression models. The results from the time regression models, where we controlled for firm-specific and economic factors, were then used to analyze the changes in value relevance over time.

We conclude with increased total value relevance in Norway over time after the transition to IFRS. The positive time trend is supported by increased value relevance of earnings over time, which is found to be associated with increased recognition of intangible assets. Increased extent of fair value accounting is found to contribute to increased value relevance of book value of equity over time. However, our robustness tests did reveal that the increasing value relevance of earnings over time may be driven by scale effects – and may actually be decreasing. The other results are robust.

We conclude with the impact of IFRS over time, as the original standards have changed, on the total value relevance of accounting information in Norway has been positive. Therefore, we claim that IFRS reaches its objective of providing existing and potential equity investors, lenders and other creditors with useful financial information.

Preface

Before we started to explore possible research topics for our master thesis, we had two requirements. First, we wanted to find a research topic that would fit both our master programs (Accounting and Finance). Secondly, we wanted to find a research topic that would secure that we would both learn something new and use the knowledge we have gained throughout our years at the Norwegian School of Economics.

This master thesis has given us the opportunity to explore value relevance, a research topic that was unknown to us at the beginning of the semester. Throughout the semester, we have experienced a substantive transfer of knowledge, as our backgrounds are from two different master programs. We have also learned a lot about how to write an academic and quantitative research paper.

We would first like to thank our supervisor, Kjell Henry Knivsflå, for suggesting value relevance as a research topic for our master thesis, as it has fulfilled our requirements. Secondly, we would like to thank Knivsflå for his guidance, feedback and valuable insight into existing value relevance research.

Contents

List of Tabels and Figures

Panel A: List of Tables

Panel B: List of Figures

1. Introduction

In this master thesis, we analyze the changes in the value relevance of accounting information for firms listed on Oslo Stock Exchange (OSE) over time after the transition to International Financial Reporting Standard (IFRS) in 2005. IFRS was established to align the financial reporting worldwide. Today, 166 jurisdictions have transitioned to IFRS, and jurisdictions continue to transition to or converge towards IFRS (International Financial Reporting Standards Foundation, 2018). For this master thesis, we have developed the following research question: *Has the value relevance of accounting information in Norway increased over time after the transition to IFRS?*

Value relevance is defined as "the ability of financial information to capture and/or summarize information that determines firm value" (Beisland & Hamberg, 2008, p. 138). Value relevance of accounting information after the transition to IFRS is an important research topic because the objective of IFRS is to provide existing and potential equity investors, lenders and other creditors with useful financial information (International Accounting Standards Board [IASB], 2010). If equity investors, lenders and other creditors base their decisions on other factors than the financial statements, IFRS does not satisfy the users it is supposed to focus on (Beisland, 2009, p. 7).

To analyze the changes in value relevance, we use regression analysis, which according to Beisland (2008a) is the most common statistical test methodology in value relevance research. Value relevance models are based on the theoretical framework about residual income developed by Ohlson (1995), and central regression models are a price regression model and time regression models (Beisland, 2008a). A price regression model expresses a firm's market value of equity as a function of its book value of equity and often also its earnings. In this master thesis, we use a price regression model to obtain value relevance measurements entering in the time regression models. The results from the time regression models are used to analyze the changes in value relevance of accounting information over time.

Based on our main tests, we conclude with increased total value relevance of accounting information in Norway over time after the transition to IFRS. The conclusion is consistent with the findings of Collins, Maydew and Weiss (1997) and Gjerde, Knivsflå and Sættem (2011), who found increased value relevance over time. The positive time trend is supported by increased value relevance of earnings over time, which is found to be associated with increased recognition of intangible assets. Increased extent of fair value accounting is found to contribute to increased value relevance of book value of equity over time.

To validate the results from our main tests, we perform several robustness tests and discuss econometric issues regarding our value relevance models. The robustness tests include using delayed market value of equity, discussing heteroscedasticity, multicollinearity and autocorrelation, and winsorizing at 2%. We also discuss the scaling issue and run a return regression model and an abnormal return regression model. The results from these robustness tests support the conclusion from our main tests of increased total value relevance over time. The robustness tests also support the conclusion of increased extent of fair value accounting contributing to increased value relevance of book value of equity over time. However, the robustness tests do reveal that the increasing value relevance of earnings over time may be driven by scale effects – and may actually be decreasing.

Overall, we conclude with increased total value relevance of accounting information in Norway over time after the transition to IFRS, associated with increased recognition of intangible assets and extent of fair value accounting. We control for firm-specific characteristics and economic factors which may affect the value relevance of accounting information. Consequently, we conclude with the impact of IFRS over time, as the original standards have changed, on the total value relevance of accounting information in Norway has been positive. Therefore, we claim that IFRS reaches its objective of providing existing and potential equity investors, lenders and other creditors with useful financial information.

This master thesis contributes to existing value relevance literature as we are the first to analyze the changes in the value relevance of accounting information in Norway over time after the transition to IFRS. Existing research on value relevance in Norway focuses either on Norwegian General Accounting Standards (NGAAP) or the transition to from NGAAP to IFRS (see Gjerde, Knivsflå and Sættem [2008, 2011] and Beisland and Knivsflå [2015]).

This master thesis is organized as follows. First, we review existing literature and develop our hypotheses. Secondly, we describe our test methodology. Thirdly, we present our data sample and the descriptive statistics. Fourthly, we present the results from our main tests. Fifthly, we perform several robustness tests to validate the results from our main tests and discuss econometric issues regarding our value relevance models. Finally, we make an overall conclusion on whether the value relevance of accounting information in Norway has increased over time after the transition to IFRS.

2. Literature Review and Hypotheses Development

IFRS is a set of international accounting standards, established to align the financial reporting worldwide. The European Parliament and the Council of the European Union, including Norway through the European Economic Area-agreement, decided that all firms listed within the European Union (EU) countries had to report according to IFRS by 2005 (Finansdepartementet, 2004). Today, 166 jurisdictions have transitioned to IFRS, and jurisdictions continue to transition to or converge towards IFRS (International Financial Reporting Standards Foundation, 2018). IFRS is balance sheet-oriented, and the two fundamental qualitative characteristics are relevance and faithful representation (Picker et al., 2016, p. 7).

The objective of IFRS is to provide existing and potential equity investors, lenders and other creditors with useful financial information (IASB, 2010). Value relevance of accounting information after the transition to IFRS is, therefore, an important research topic. If equity investors, lenders and other creditors base their decisions on other factors than the financial statements, IFRS does not satisfy the users it is supposed to focus on (Beisland, 2009, p. 7).

Beisland and Hamberg (2008) defined value relevance as “the ability of financial information to capture and/or summarize information that determines firm value” (p. 138). This definition is coherent with the definition by Francis and Schipper (1999). Value relevance research analyzes the statistical association between market value of equity (MVE) and accounting information (AI), which Beisland (2008a, p. 9) formally defined as:

$$MVE = f(AI) \quad (1)$$

Value relevance research analyzes how much AI affects MVE, in other words, how much AI explains the variation in MVE (Beisland, 2008a). The higher the correlation between AI and MVE is, the higher the usefulness of AI is for equity investors, and the higher the value relevance of AI is (Beisland, 2012). Mathematically, the impact of changes in AI on MVE can be expressed as: $f'(AI) = \frac{\partial MVE}{\partial AI}$.

Beisland (2008a) claimed in his review of the value relevance literature that value relevance research is part of Capital Market-Based Accounting Research (CMBAR; p. 2). CMBAR also includes topics such as fundamental analysis and valuation, tests of market efficiency and the role of accounting numbers in contracts and the political process (Kothari, 2001, p. 108). According to Beisland (2008a) modern CMBAR originated with Ball and Brown (1968) and Beaver (1968; p. 2). Ball and Brown (1968) and Beaver (1968) analyzed the information content of earnings announcements and found the first evidence of earnings' effect on stock return.

This chapter is organized as follows. First, we present the main findings of the most recognized and pioneering value relevance research over time, central to our master thesis. Secondly, we present research on factors found to be affecting value relevance. Thirdly, we present the most important changes to- and value relevance of IFRS since 2005. Finally, we develop our hypotheses based on the literature review.

2.1 Value Relevance Research over Time

Most of the recognized and pioneering value relevance research is based on non-Norwegian (often American [U.S.]) data samples. As Beisland (2008b) pointed out, one can argue that those results are not directly transferable to our master thesis, which focuses on Norway. Still, we choose to include them in our literature review as they provide a solid theoretical background for developing our hypotheses. Based on this, we first present value relevance research over time based on non-Norwegian data samples. Afterward, we present value relevance research over time based on Norwegian data samples.

2.1.1 Value Relevance Research Based on Non-Norwegian Data Samples

Changes in value relevance over time is a popular research topic, but the findings are somewhat conflicting. On the one hand, Collins et al. (1997) used a price regression model to analyze the value relevance over the time period 1953-1993 for firms listed on NYSE, AMEX and NASDAQ, and compared the relative explanatory powers. The three main findings of Collins et al. were: (1) the incremental value relevance of book value of equity had increased, (2) the incremental value relevance of earnings had decreased, and (3) the combined value relevance of earnings and book value of equity, total value relevance, had increased slightly.

Francis and Schipper (1999) conducted a similar analysis as Collins et al. on a sample of U.S firms over the time period 1952-1994 with consistent findings. Furthermore, a more recent study supporting the findings of Collins et al. is a working paper by Barth, Li and McClure (2018). Barth et al. analyzed the time period 1962-2014 and found that earnings (book value of equity) had become significantly less (more) value relevant. The net effect was no decrease in the total value relevance of accounting information over time. If anything, Barth et al. found some evidence of an increase.

On the other hand, Lev and Zarowin (1999) analyzed the value relevance of a U.S. data sample over the time period 1978-1996 and found evidence of decreasing value relevance of reported earnings, book values and cash flows. This is supported by Aboody and Lev (1998). Furthermore, Brown, Lo and Lys (1999) showed that findings of increased total value relevance over time of Collins et al. (1997) and Francis and Schipper (1999) were largely attributable to increased coefficient of variation of scale over time. After controlling for scale effects, Brown et al. found a decrease in total value relevance over time. Also, Core, Guay and Van Buskirk (2003) support the finding of decreasing total value relevance over time.

A research conducted by Landsman and Maydew (2002) provides conflicting findings to all of the research presented above. By analyzing the changes in the information content of earnings over the time period 1972-1988, Landsman and Maydew found no evidence of decreased value relevance of earnings. If anything, they found an increase in the value relevance of the quarterly earnings announcement over time.

Moreover, looking at value relevance research regarding the transition to IFRS, there are, also here, somewhat conflicting findings. The conflicting findings are for whether accounting information prepared in accordance with IFRS, compared to other national accounting principles (GAAP), has higher value relevance or not. On the one hand, Leuz and Wysocki (2006), Sondstrom and Sun (2007) and Barth, Landman and Lang (2008) found that accounting information prepared in accordance with IFRS, compared to GAAP, has higher total value relevance. On the other hand, Eccher and Healy (2003) and Hung and Subramanyam (2007) found no evidence of accounting information prepared in accordance with IFRS having higher total value relevance.

To summarize, the most recognized and pioneering research on value relevance over time, based on non-Norwegian data samples, provides conflicting evidence not only of the total value relevance but also regarding the value relevance of book value of equity and earnings. Existing value relevance research is also conflicting on whether or not accounting information prepared in accordance with IFRS has higher total value relevance than accounting information prepared in accordance with GAAP.

2.1.2 Value Relevance Research Based on Norwegian Data Samples

As mentioned, value relevance research based on non-Norwegian data samples is not directly transferable to our master thesis, which focuses on Norway. We will, therefore, in the following section, present the most recognized and pioneering value relevance research based on Norwegian data samples.

The most comprehensive research on the value relevance of Norwegian accounting information is by Gjerde et al. (2011), who analyzed the changes over the 40 years before IFRS was introduced. Gjerde et al. found that the total value relevance of accounting information had increased, also after controlling for changes in economic value relevance drivers. Further, Gjerde et al. found that the value relevance of the balance sheet had not decreased and that the value relevance of the income statement had increased over time. These findings are in contrast to e.g., Collins et al. (1997) and Francis and Schipper (1999). Gjerde et al. explained these conflicting findings with NGAAP being more earning orientated than the American Accounting Standards (US GAAP), which is more balance sheet orientated.

The most central value relevance research regarding the transition to IFRS is by Beisland and Knivsflå (2015), who used a sample of firms listed on OSE over the time period 2001-2008 that reported according to IFRS and NGAAP. Beisland and Knivsflå found that a fair-value accounting system (as IFRS) increased the value relevance of book value of equity and decreased the value relevance of earnings. This is consistent with the findings of Collins et al. (1997). Beisland and Knivsflå (2008) found that the response coefficient for book value of equity had increased over time after the transition to IFRS, from NGAAP, while the earnings response coefficient had decreased.

2.2 Research on Other Factors Affecting Value Relevance

Existing research has shown that several firm-specific characteristics and economic factors may affect the value relevance of accounting information. These factors should be controlled for when analyzing value relevance to avoid omitted variable bias. In the following section, we, therefore, present the most common factors found to affect value relevance. Three categories are used to categorize these factors: risk and scale-, other value relevant-, and explanatory (test) factors (Beisland & Knivsflå, 2015).

2.2.1 Risk and Scale Factors

Firm Size

According to Fama and French (1993), firm size is a relevant proxy risk factor on the cross-section of firms, and this is controlled for by e.g., Beisland and Knivsflå (2008) and Gjerde et al. (2011). E.g., small firms may be more sensitive to business conditions, and thereby will firm size capture the sensitivity to macroeconomic risk factors. In addition, larger firms often have more resources to implement high-quality financial reporting, which makes their financial statements more value relevant. Hayn (1995) and Collins et al. (1997) claimed that larger firms are less likely to report losses and less risky, and thereby implied a positive relationship between the value relevance of earnings and firm size.

Firm size can also be a scaling factor as small firms have smaller market capitalization, smaller book value of equity and smaller earnings relative to larger firms, see *Section 6.5.1* (Gjerde et al., 2008, 2011). This is supported by Easton and Sommers (2003), who stated that "it is difficult to support an argument that any variable is a better measure of scale than market capitalization" (p. 25).

2.2.2 Other Value Relevant Factors

Loss Intensity

Hayn (1995) and Collins, Pincus and Xie (1999) analyzed the information content of losses and found that (1) negative earnings are less informative than positive earnings and (2) controlling for losses increased the value relevance of accounting information. Research from Basu (1997), Collins et al. (1997) and Beisland and Knivsflå (2008) supports that losses have low or no association with the market value of equity. Barth, Beaver and Landsman (1998) suggested that the value relevance of book value of equity increases at the expense of earnings when earnings are negative.

Non-Recurring Items

Non-recurring items is a factor that has been found to affect value relevance in existing research, based on accounting information prepared in accordance with other accounting standards than IFRS. Collins et al. (1997) found that non-recurring items have lower value relevance than ordinary items, and Elliott and Hanna (1996) and Hayn (1995) suggest that non-recurring items affect the value relevance of earnings negatively. However, since IFRS prohibits the presentation of any items as ‘extraordinary items’ explicitly (IAS 1 *Presentation of Financial Statements)*, this not a relevant factor for our master thesis (Deloitte, 2018a).

Excess Market Return

Firms reporting according to IFRS have to use the cost method for measuring non-financial assets unless fair value can be measured reliably (then they can use the revaluation model). A research on firms listed on OSE in 2014, showed that only 1% for property, plant and equipment (IAS 16 *Property, Plant and Equipment*) and 0% for intangible assets (IAS 38 *Intangible Assets*) followed the revaluation model for at least one asset group (Stendal & Nordgarden, 2015, p. 65). This implies that the majority of firms follow the cost model for their non-financial assets. In the cost model, impairment losses must be recognized when incurred, while impairment gains cannot be recognized before they are realized. Since the majority of firms follow the cost model, accounting information is expected to be more value relevant when stock market returns are low (Gjerde et al., 2008, p. 99). This implies that excess market return affects value relevance negatively.

Market Volatility

Francis and Schipper (1999) claimed that if the value relevance of accounting information is (really) constant over time, but the market volatility is increasing for reasons that the accounting information does not capture, the statistic test will be biased towards a decreasing value relevance of accounting information over time (p. 321). Therefore, failing to control for market volatility might cause wrong interpretations as value relevance depends on the volatility of the market value of equity (Francis & Schipper, 1999). This implies that market volatility will affect the value relevance negatively because it creates noise in the stock market.

2.2.3 Explanatory Factors

Intangible Assets and Fair Value Accounting

According to Beisland and Knivsflå (2015) the two major changes in accounting regulations following the IFRS transition, compared to NGAAP, are that "IFRS allow more measurement at fair value and recognize more intangible assets" (p. 62). Based on this, we present the main findings from research analyzing intangible assets and fair value accounting in the following section.

Intangible Assets

A recognized view is that capitalizing intangible assets is more value relevant than expensing them as incurred or through goodwill amortization (Gjerde et al., 2008, p. 111). Aboody and Lev (1998) found that capitalized development cost is positively associated with stock returns and concluded with capitalization being value relevant for equity investors.

Existing research on intangible assets, from different time periods, has found different associations between intangible assets and value relevance. A possible explanation for this is that the accounting standards for intangible assets have changed over time. Historically, Lev and Zarowin (1999) found evidence of decreasing value relevance of reported book values, earnings and cash flows over the time period 1978-1996. Lev and Zarowin explained this to be because of increased investments in intangible assets. At the time, investments in intangible assets had to be expensed, even if they had a positive value creation for the next couple of years. Based on this, Lev and Zarowin claimed that the accounting standards for intangible assets failed to reflect a firm's value and performance.[1]

Recently, a research by Gjerde et al. (2008) found that intangible assets-intensive firms report a net operating income that on the margin is more value relevant when prepared in accordance with IFRS, compared to NGAAP (p. 93). Further, Gjerde et al. stated that the marginal increase in value relevance of earnings is associated with increased recognition of intangible assets (p. 106). Moreover, Beisland and Knivsflå (2015) found that increased recognition of intangible assets decreased the value relevance of book value of equity and increased the value relevance of earnings (p. 60). Dichev and Tang (2008) stated that if the accounting standards allowed for better matching the expenditures of the investments with future economic

[1] Supported by Lev and Sougiannis (1996) and Aboody and Lev (1998). See also Collins et al. (1997) and Francis and Schipper (1999).

benefits/revenues, by e.g., increased recognition of intangible assets, the persistence of earnings would increase and thereby, the value relevance of earnings would increase.[2] The increase in value relevance of earnings would be at the expense of the value relevance of book value of equity (Beisland & Knivsflå, 2015, p. 47).

Fair Value Accounting

According to Beisland and Knivsflå (2008) "prior research presents evidence that fair value accounting increases the value relevance of the balance sheet – though some mixed evidence exists" (p. 247; see e.g., Barth, 1994; Petroni and Wahlen, 1995; Barth, Beaver and Landsman, 1996). B1eisland and Knivsflå (2015) found that the increased extent of fair value accounting with IFRS increased the value relevance of the balance sheet (supported by Barth et al. 1996) and decreased the value relevance of the income statement (supported by Hann, Heflin, & Subramanayam, 2007) (p. 60). Beisland (2009) stated that several researchers have found evidence of increased value relevance of the balance sheet because of the increased extent of fair value, but that the value relevance of earnings decreases when historical cost is abandoned (p. 24). A possible explanation for this is that "more frequent and larger revaluations make reported earnings less persistent and thus less value relevant" (Ohlson, 1995; Beisland & Knivsflå, 2015, p. 43). Consequently, decreased persistence of earnings because of increased extent of fair value accounting decreases the value relevance of earnings in favor of the value relevance of book value of equity (Ohlson, 1995).

Net Effect of Intangible Assets and Fair Value Accounting

Beisland and Knivsflå (2015) analyzed the net effect of increased recognition of intangible assets and extent of fair value accounting (p. 43). Beisland and Knivsflå found that the fair value-effect (increased value relevance) surpassed the intangible assets-effect (decreased value relevance) for the balance sheet, resulting in a positive net effect. For the income statement, the two effects were found to cancel each other out, resulting in no net effect on the value relevance of earnings.

2.3 Changes to and the Value Relevance of IFRS

In this section, we highlight the most important changes to IFRS, effective from 2006 to 2017, and their expected effect on the value relevance of accounting information. Since IFRS

[2] See also Bart, Li and Mcclure (2018).

became mandatory with effect from 2005, the changes to the accounting standards were stable until the financial crisis in 2008. In response to the financial crisis, there was a wave of changes to IFRS, most of them effective from 2013/2014 (S. Kvifte, personal communication, September 6, 2018; EY, 2011b). Afterward, there has been a new stable time period that will last until a new wave of changes becomes effective in 2018/2019. The total effect of all these changes to IFRS since 2005 is expected to be greater than the changes because of the transition from NGAAP to IFRS (Haugnes & Bernhoft, 2013).

In *Table 2-1*, an overview of the most important changes to IFRS affecting our master thesis is presented. For a more detailed description see *Appendix A*. We do not present changes to IFRS that are not effective until after our time period (2017), such as IFRS 9 *Financial Instruments*, IFRS 15 *Revenue from Contracts with Customers* and IFRS 16 *Leases*. These are not presented because they are not expected to affect our data sample as firms rarely choose an early adoption (S. Kvifte, personal communication, September 6, 2018). Changes to IFRS that became effective before our time period (2005) will not be discussed as they have been constant throughout our time period. Finally, we do not discuss the differences between IFRS and NGAAP as firms reporting according to NGAAP is out of our scope. Nevertheless, to read about this topic we recommend Gjerde et al. (2008, pp. 94-95).

Table 2-1: Overview of the Most Important Changes to IFRS Effective from 2006 to 2017

Standard	**Effective from**	**Major changes**[3]	**Expected effect on value relevance**
IFRS 3 Business Combinations	2008	– Acquisition costs must be expensed as they are no longer defined as a part of the acquisition price – The consideration now includes all interest that the acquirer has held previously in the target firm, measured at fair value – The acquirer can now, on a transaction basis, choose between measuring non-controlling interest at full fair value or fair value of their proportion of identifiable assets and liabilities – Contingent consideration must now be measured at fair value	Increased value relevance
IAS 38 Intangible assets	2008 and 2009	– Clarification of under which circumstances a firm could recognize a prepayment asset for advertising or promotional expenditure – Increased extent of when the unit of production method can be used – All identifiable intangible assets acquired in a business combination now satisfies the requirements for recognition, leading to increased recognition of intangible assets	Increased value relevance

[3] See *Appendix A* for references.

IFRS 7 Financial Instruments: Disclosures	2009	– All firms who have a financial instrument must now disclose it, thus disclosing the method and assumptions used to calculate fair value	Increased quality of the accounting information
IFRIC 15 Agreements for the Construction of Real Estate	2009	– Limits the possibility to recognized revenue as construction progresses, meaning firms must recognize revenue at completion or after delivery	Decreased value relevance
IAS 19 Employee Benefits	2013	– The corridor approach, which allowed parts of actuarial gains and losses to be held outside the balance sheet, is eliminated	Increased value relevance
IFRS 13 Fair Value Measurement	2013	– New, common standard for measuring fair value, when fair value is required/permitted. – No change in the requirements for what assets/liabilities that should be measured at fair value, and most of the principles corresponds to how fair value was measured before	No effect on value relevance
IFRS 10 Consolidated Financial Statements	2014	– New definition of having "control" of another firm, increasing the possibility of a firm being deemed to have control over another firm	Increased value relevance
IFRS 11 Joint Arrangements	2014	– Now only two categories, joint operations (former jointly controlled assets and jointly controlled operations) and joint venture – The deciding factors are the rights and obligations, not the legal structure of the arrangement as before – The former proportionate consolidation method is eliminated	Decreased quality of the accounting information
IFRS 12 Disclosure of Interests in Other Entities	2014	– The disclosures related to subsidiaries, joint ventures and interests in another firm, which are not consolidated, now have to be combined into a single disclosure	Decreased quality of the accounting information

Table 2-1 shows that the expected effects of the changes to IFRS on the value relevance of accounting information are ambiguous. The changes to IFRS 7, IFRS 11 and IFRS 12 were mainly regarding disclosure of information and, therefore, expected to only affect the quality of the accounting information and not the value relevance. We expect IFRS 13 to have affected neither the value relevance nor the quality of the accounting information, as it was merely an assembly of the existing methods for measuring fair value. Regarding total value relevance of accounting information, we expect the introduction of IFRS 3, which led to an increased extent of fair value accounting, to have increased the value relevance over time. Further, we expect the changes to IAS 38, which led to increased recognition of intangible assets, to also have increased the total value relevance over time. For book value of equity, we expect the changes to IAS 19 to have increased the value relevance because parts of actuarial gains and losses are no longer held outside the balance sheet. In addition, IFRS 10 is expected to have increased the value relevance of book value of equity as the possibility of a firm having control over another firm increased. For earnings, IFRIC 15 is expected to have decreased the value

relevance, as firms now must recognize revenue at completion or after delivery for certain agreements.

2.4 Hypotheses

In this master thesis, we analyze the changes in the value relevance of accounting information in Norway over time after the transition to IFRS. We have developed three hypotheses based on the presented literature review.

In the first hypothesis, we analyze the effect of IFRS on the total value relevance of accounting information over time. We aim to exclusively examine the effect of IFRS over time as the original standards have changed. With the introduction of IFRS 3 and the changes to IAS 38, we expect the total value relevance of accounting information to have increased over time. Further, Collins et al. (1997) and Francis and Schipper (1999) found that the total value relevance of accounting information has increased slightly over time. In addition, e.g., Barth et al. (2008) and Gjerde et al. (2011) found that the total value relevance has increased after the transition to IFRS. However, since existing research has somewhat conflicting findings regarding the changes in total value relevance of accounting information over time, we perform a two-sided test. Our first hypothesis is:

Hypothesis 1: The total value relevance of accounting information in Norway has increased over time after the transition to IFRS.

To test hypothesis 1, we use a price regression model and time regression models, and analyze the development in the explanatory power from the price regression model over the time period 2005-2017 for firms listed on OSE.

In the second hypothesis, we analyze the development in value relevance of book value of equity and earnings over time. This hypothesis is also based on the changes to IFRS and existing value relevance research. The changes to IAS 19 are expected to have increased the value relevance of book value of equity, and IFRIC 15 is expected to have decreased the value relevance of earnings. Moreover, Beisland and Knivsflå (2015) found that a fair-value accounting system (as IFRS) increases (decreases) the value relevance of the book value of equity (earnings). However, we will also for this hypothesis perform a two-sided test, consistent with Gjerde et al. (2011, p. 116). Our second hypothesis is:

Hypothesis 2: The value relevance of book value of equity has increased, and the value relevance of earnings has decreased, in Norway over time after the transition to IFRS.

To test hypothesis 2, we use a price regression model and time regression models to analyze the development in the response coefficients and the incremental explanatory power for book value of equity and earnings over the time period 2005-2017 for firms listed on OSE.

Furthermore, the changes to IFRS has led to increased recognition of intangible assets (IAS 38) and extent of fair value accounting (IFRS 3). Since Beisland and Knivsflå (2015) found that these two effects are affecting the value relevance of accounting information, we have developed an associated hypothesis to hypotheses 1 and 2. Our third hypothesis is:

Hypothesis 3: Hypotheses 1 and 2 are associated with increased recognition of intangible assets and extent of fair value accounting.

To test hypothesis 3, we add explanatory variables to the time regression models used to test hypotheses 1 and 2.

3. Test Methodology

In this chapter, we present the test methodology we use to analyze the changes in the value relevance of accounting information in Norway over time after the transition to IFRS. The most common statistical test methodology in value relevance research is regression analysis (Beisland, 2008a).

This chapter is organized as follows. First, we present the value relevance models over time, the time regression models. Secondly, we present the annual value relevance model, the price regression model. Thirdly, we discuss the explanatory powers (and decompositions) used in the value relevance models.

3.1 The Time Regression Models

To analyze the changes in value relevance of accounting information over time, we define a time regression model, consistent with e.g., Collins et al. (1997), Lev and Zarowin (1999) and Gjerde et al. (2011):

$$VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t \quad (2)$$

Where VRM_t is the value relevance measure at time *t* (*t=1, 2, ..., 13*), and $TIME_t$ is the time trend variable.[4, 5] Further, α_0 is the constant term, α_1 is the response coefficient and ε_{it} is the error term.

Existing research has shown that several firm-specific characteristics and economic factors may affect the value relevance of accounting information (e.g., Hayn, 1995; Lev & Zarowin, 1999; Beisland & Knivsflå, 2008), see *Section 2.2.* Therefore, we control for these factors by including control variables. By including control variables, we aim to exclusively examine the effect of IFRS over time, as the original standards have changed, on the value relevance of accounting information in Norway:

$$VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t \quad (3)$$

Where $CONT_t$ is a vector of control variables with the possibility of affecting the value relevance of accounting information. The control variables included in $CONT_t$ should be independent of the time trend ($TIME_t$) and not interdependent (Gjerde et al., 2011).

There have been several changes to IFRS since 2005, where the most important changes are presented in *Section 2.3*. To exclusively examine the effect of IFRS over time, we have chosen to also include a time variable approximated by the time trend itself ($TIME_t$), in accordance with e.g., Collins et al. (1997) and Lev and Zarowin (1999).[6] A significant positive time trend indicates increased value relevance of accounting information over time because of the changes to IFRS, as other factors affecting the value relevance are controlled for ($CONT_t$).

Based on existing research presented in *Section 2.2*, we have chosen to include firm size ($SIZE$), loss intensity ($LOSSTEN$), excess market return ($MRET$) and market volatility ($MVOL$) as our control variables ($CONT_t$).[7] We expect $SIZE$ to affect the value relevance both positive and negative. Small (large) firms are more (less) sensitive to macroeconomic risk factors, implying a negative (positive) relationship between value relevance and firm size (Fama & French, 1992). We expect $LOSSTEN$ to affect the value relevance of book value of equity

[4] $TIME_t$ = 1, 2, .., 13. 1 being 2005, and 13 being 2017.
[5] When first-order autocorrelation is present, we control for it by using the Newey-West standard error, consistent with Gjerde et al. (2011). If only heteroscedasticity is present, we control for it by using heteroscedasticity robust standard errors (also called White-Huber standard errors). This is stated in the table text for all time regression models.
[6] As there have not been any “accounting revolutions” in our time period, we have chosen to not include a dummy variable for sub time periods. See Gjerde et al. (2011) for this method.
[7] Details on how the control variables are calculated are presented in *Section 4.2*.

positively, at the expense of earnings (decreased value relevance) (Barth et al., 1998). Finally, consistent with Gjerde et al. (2011), we include excess market return (*MRET*) and market volatility (*MVOL*) to control for important changes in the Norwegian economy during our 13-years period (p. 120). We expect both *MRET* and *MVOL* to affect value relevance negatively. The effect of excess market return is caused by accounting information being more value relevant when stock market returns are low as discussed in *Section 2.2.2*. The negative effect caused by *MVOL* is because increased volatility leads to increased noise in the stock market (Francis & Schipper, 1999).

Moreover, we do not only seek to analyze if the value relevance of accounting information in Norway has increased over time after the transition to IFRS, but also if the increase is associated with increased recognition of intangible assets and extent of fair value accounting. Therefore, we expand the time regression model (2) with explanatory variables:

$$VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t \qquad (4)$$

Where EXP_t is a vector of explanatory variables with the possibility of affecting both the changes in value relevance and the time-trend variable ($TIME_t$). The EXP_t-vector consists of two explanatory variables,[8] $INTANTEN_t$ and $FAIR_t$. $INTANTEN_t$ is the intensity of intangible assets relative total assets, and $FAIR_t$ is the extent of fair value accounting, measured as the intensity of financial assets relative to total assets.[9] The interaction term between $INTANTEN_t$ ($FAIR_t$) and $TIME_t$ captures the potential explanation the increased recognition of intangible assets (extent of fair value accounting) has for the time trend. The partial change in value relevance because of the time trend can mathematically be expressed as: $\frac{\partial VRM_t}{\partial TIME_t} = \alpha_1 + \alpha_2 EXP_t$. Where α_1 is average annual growth in the value relevance, and α_2 is the interaction effect between the time trend and the explanatory variables.

Likewise, the partial change in value relevance because of the explanatory variables can mathematically be expressed as: $\frac{\partial VRM_t}{\partial EXP_t} = \alpha_2 TIME_t + \alpha_3$. Where α_3 is the explanatory variables fixed effect on the value relevance. Note that we have to be careful with interpreting α_3 alone (Wooldridge, 2012, p. 199). This is because α_3 is the effect of the explanatory variables on the value relevance when $TIME_t=0$, which it never is ($TIME= 1, 2, ..., 13$). The

[8] Details on how the explanatory variables are calculated are presented in *Section 4.2*.

[9] We have chosen the intensity of financial assets to be a proxy for the extent of fair value accounting because financial assets are measured at fair value in accordance with IAS 39 *Financial Instruments: Recognition and Measurements*.

interpretation of the fixed effect of the explanatory variables (α_3) is, therefore, meaningless. α_3 is merely the value that the fitted line crosses the y-axis with (a constant term).

Two effects can explain the increased recognition of intangible assets over time, which we cannot distinguish between: (1) the changes to IFRS (increased recognition of intangible assets), and (2) firms having more intangible assets relative to other assets because of e.g., Industry 4.0,[10] ceteris paribus. Likewise, two effects can explain the increased extent of fair value accounting over time, which we cannot distinguish between: (1) the changes to IFRS (increased extent of fair value accounting), and (2) firms having more assets measured at fair value relative to other assets, ceteris paribus. Consequently, $INTANTEN_t$ and $FAIR_t$ are only proxies for the changes to IFRS regarding the recognition of intangible assets and the extent of fair value accounting respectively. Since $INTANTEN_t$ and $FAIR_t$ represent the changes to IFRS, they are included as explanatory variables – not as control variables.

Based on existing research and the changes to IFRS, presented in *Section 2.2.3* and *2.3* respectively, we expect increased recognition of intangible assets to increase the total value relevance over time, and thereby, the interaction term between $TIME_t$ and $INTANTEN_t$ to be positive. This is because (1) increased capitalization of intangible assets is expected to make the accounting information more relevant to equity investors, and (2) the changes to IFRS, as presented in *Table 2-1*, have led to increased recognition of intangible assets over time (Aboody & Lev, 1998). In deep, and consistent with Beisland and Knivsflå (2015), we expect increased recognition of intangible assets to lead to decreased value relevance of book value of equity and increased value relevance of earnings over time. This is because recognition of intangible assets leads to better matching between investments and future revenues (Dichey & Tang, 2008; Beisland & Knivsflå, 2015, p. 43). The total value relevance effect of increased recognition of intangible assets is expected to be positive. Moreover, and consistent with Beisland and Knivsflå (2008, 2015) we expect the increased extent of fair value accounting to increase the value relevance of book value of equity over time. Further, we expect increased extent of fair value accounting to decrease the value relevance of earnings over time. This is because increased extent of fair value accounting might lead to more frequent and larger revaluations in earnings, which again leads to decreased value relevance of earnings (Ohlson, 1995; Beisland & Knivsflå, 2015, p. 43). Finally, increased extent of fair value accounting is

[10] Industry 4.0 refers to a new phase in the Industrial Revolution that focuses heavily on interconnectivity, automation, machine learning and real-time data (Epicor, 2018).

expected to increase the total value relevance, and thereby, the interaction term between $TIME_t$ and $FAIR_t$ is expected to be positive.

Finally, we analyze the changes in value relevance over time where we include both the explanatory variables (EXP_t) and control variables ($CONT_t$) at once:

$$VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\, CONT_t + \varepsilon_t \qquad (5)$$

In the following sections, we present how to obtain the value relevance measure for each year (VRM_t), entering in time regression models (2-5). An overview of the different *VRM*-variables is presented in *Appendix C*.

3.2 The Price Regression Model

Value relevance models are based on the theoretical framework about residual income developed by Ohlson (1995). From the Ohlson-model, a linear cross-sectional regression model can be derived, called price regression model,[11] (showed by e.g., Christiensen & Feltham, 2012). According to Beisland (2008a), a price regression model is the most central regression model in value relevance research. Therefore, we use a price regression model to obtain the value relevance measurements (VRM_t) entering in time regression models (2-5) (as e.g., Easton & Harris, 1991; Gjerde et al., 2011).

A price regression model expresses a firm's market value of equity as a function of its book value of equity and often also its earnings (Collins et al., 1997; Ohlson, 1995; Beisland, 2008a). Earnings are often included in a price regression model since (1) from the Ohlson-model it can be shown that a firm's market value of equity can be estimated as a function of book value of equity and earnings, and (2) book value of equity and earnings are considered to be the primary accounting summary measures (Beisland, 2008a; Barth et al., 2018, p. 9).[12] Consequently, we choose to include both book value of equity and earnings in our price regression model.

[11] The Ohlson model included $1/(1+r_r)$ to discount future residual income, where r_r is expected rate of return. However, when the expected rate of return is assumed to be exogenous, the market value of equity only depends on the accounting variables (Collins et al., 1997; Beisland, 2012). In addition, Maydew (1993) found that allowing the expected rate of return to vary between firms does not improve the explanatory power of the model.
[12] Supported by Miller and Modigliani (1966) and Ohlson (1995). Penman (1998) also showed that these two variables can be combined in equity valuation.

Existing value relevance research has shown that a price regression model where a firm's market value of equity is a function of its book value of equity and earnings suffers from several well-known econometrics issues (e.g., Brown et al., 1999; Gu, 2007). This will be discussed in *Section 6.2, 6.3* and *6.5.1.* One of the most discussed econometric issues is the scaling issue, and to reduce the scaling issue we deflate the price regression model by the number of outstanding shares (e.g., Christie, 1987; Gjerde et al., 2008; Beisland, 2008b; Beisland & Knivsflå, 2008). This is supported by Barth and Clinch (2009), who argue that the most effective way to scale the Ohlson-model is by the number of outstanding shares. Therefore, the market value of equity (MVE_{it}) of firm *i* in year *t* will be a function of its book value of equity per share ($BVPS_{it}$), and its earnings per share (EPS_{it}).

Since we include EPS_{it} as a separate variable in the price regression model we need to adjust $BVPS_{it}$. This is because EPS_{it} is included in $BVPS_{it}$. We do this by computing $BVPS'_{it-1}$, which is the book value of equity for firm *i* at time *t-1* plus dirty surplus per share during time *t*, less net dividends per share in year *t*, as firms have already paid out dividends at the end of year t and are not included in MVE_{it}. This denotes that $BVPS'_{it-1} = BVPS_{it} - EPS_{it}$ (Beisland & Knivsflå, 2008; Gjerde et al., 2008, 2011). EPS_{it} is subtracted from $BVPS_{it}$ in order to reduce collinearity and to obtain the right loading of EPS_{it} in the analysis (Gjerde et al., 2008, 2011). Consequently, the price regression model used in this master thesis is:[13]

$$MVE_{it} = \beta_0 + \beta_1 BVPS'_{it-1} + \beta_2 EPS_{it} + \varepsilon_{it} \qquad (6)$$

Where market value of equity (MVE_{it}), the dependent variable, is the share price of firm *i* in year *t*, and it is a function of the independent variables; book value of equity per share adjusted ($BVPS'_{it-1}$), and earnings per share (EPS_{it}). Furthermore, β_0 is the constant term, β_1 (*BRC*) and β_2 (*ERC*) are the response coefficients and ε_{it} is the error term. A low response coefficient implies that the reported $BVPS'_{it-1}$ or EPS_{it} is not particularly value relevant to equity investors, while a high response coefficient implies that a (one unit) change in reported $BVPS'_{it-1}$ or EPS_{it} is associated with a large change in MVE_{it} (Lev & Zarowin, 1999). We assume that EPS_{it} includes all relevant information to predict future residual income (Beisland, 2012).

[13] The model is also used by e.g., Beisland and Knivsflå (2008) and Gjerde et al. (2008, 2011).

The constant term β_0 might be replaced by a term $\beta_0 * IND$ to adjust for fixed industry effects, where IND is a vector of dummies for each industry (Beisland & Knivsflå, 2008). The model could, of course also, be adjusted for other fixed effects.

Some existing research use an inefficiency-adjusted market value of equity (e.g., Gjerde et al., 2008, 2011),[14] or a three months delayed market value of equity to secure that the disclosed accounting information is reflected in the MVE_{it} (e.g., Beisland & Knivsflå, 2015). However, we base our price regression model (6) on the same assumption as Beisland and Hamberg (2008), namely "that the market is equally (in)efficient across our sample" (p. 146). Therefore, we make no further adjustments to price regression model (6) in regards to market inefficiency.[15]

By running the price regression model (6), we can obtain three different value relevance measures. First, VRM_t can be the adjusted R^2 (from now on only R^2) from price regression model (6), R_T^2. We then check if α_1 in time regression models (2-5) is significantly different from zero. In other words, we check if the value relevance of accounting information has changed over time to test hypothesis 1. Secondly, VRM_t can be the incremental explanatory power of BVPS′ ($R_{BVPS'}^2$) or EPS (R_{EPS}^2) derived from price regression model (6), see *Section 3.3*. Finally, VRM_t can be the response coefficient $\beta_1(BRC)$ or $\beta_2(ERC)$ from price regression model (6). The incremental explanatory powers or the response coefficients are said to have increased (decreased) if α_1 in time regression models (2-5) is significant and positive (negative). We then again check if α_1 in time regression models (2-5) is significantly different from zero to test hypothesis 2. If $\alpha_1 > 0$ when VRM_t is a measure for the value relevance of book value of equity ($R_{BVPS'}^2$ or BRC), and $\alpha_1 < 0$ when VRM_t is a measure for the value relevance of earnings per share (R_{EPS}^2 or ERC), our results are consistent with hypothesis 2.

3.3 Explanatory Power

In order to compare the explanatory power of BVPS′ and EPS for a firm's market value of equity, we decompose the total explanatory power (R_T^2) into three parts, following the method used by e.g., Collins et al. (1997): (1) the incremental explanatory power of BVPS′ ($R_{BVPS'}^2$),

---

[14] See Aboody, Hughes and Liu (2002) for details on how to adjust the price for inefficiency.

[15] Most of the value relevance research is based also on the underlying assumption of the existence of an efficient capital market (Bogstrand & Larsson, 2012). We will in *Section 6.4* use the market value of equity four months after the end of the financial year as a robustness test.

(2) the incremental explanatory power of EPS (R^2_{EPS}) and (3) the common explanatory power of both BVPS′ and EPS (R^2_{COMMON}).[16] To calculate the incremental explanatory power of BVPS′ and EPS we define two new models, the BVPS′-model (7) and the EPS-model (8):

$$MVE_{it} = \gamma_0 + \gamma_1 BVPS'_{it-1} + \varepsilon_{it} \tag{7}$$

and

$$MVE_{it} = \delta_0 + \delta_1 EPS_{it} + \varepsilon_{it} \tag{8}$$

The explanatory power from price regression model (6), BVPS′-model (7) and EPS-model (8) are denoted as R^2_T, R^2_7 and R^2_8 respectively. Further, $R^2_{BVPS'} = R^2_T - R^2_8$ is the incremental explanatory power of BVPS′, and $R^2_{EPS} = R^2_T - R^2_7$ is the explanatory incremental power of EPS. Finally, $R^2_{COMMON} = R^2_T - R^2_{BVPS'} - R^2_{EPS}$ is the explanatory power common to both $BVPS'$ and EPS. This decomposition of R^2 will be used to analyze whether the value relevance of accounting information has changed over time, as explained in *Section 3.2.*

The response coefficients and the total explanatory power from price regression model (6), and the incremental explanatory powers derived from the price regression model (6), BVPS'-model (7) and EPS-model (8) are used as measurements of value relevance, consistent with e.g., Collins et al. (1997), Beisland (2008a) and Gjerde et al. (2011). A higher response coefficient implies that the market value of equity is more sensitive to the accounting variable, while a higher explanatory power implies that a bigger part of the variation in market value of equity can be explained by the accounting variable(s) (Beisland, 2012, p. 35).

Notably, because of the scaling issue, R^2 might be overestimated and increasing in the scale factor's coefficient of variance (Brown et al., 1999). The scaling issue might be affecting the comparison of R^2 between different samples (Gu, 2007). When comparing R^2 from different samples, we cannot distinguish between the difference caused by different sampling properties and different economic relationships (Gu, 2007). However, as we only compare R^2 from different regression models within the same sample, this is not affecting our results. The scaling issue will be further discussed in *Section 6.5.1.*

[16] This technique was used by Easton (1985) but is theoretically derived by Theil (1971).

4. Data

In this master thesis, we employ data from Bloomberg and DataStream. We started out with all firms listed on OSE over the time period 2005-2017. To avoid survivorship bias, we chose to include both listed and delisted firms (693 firms).

This chapter is organized as follows. First, we describe our sample selection. Secondly, we present how we collected our variables. Thirdly, we explain winsorizing, a method used to avoid our results being affected by merely a few extreme observations. Fourthly, we present the results from the price regression model (6), BVPS′-model (7) and EPS-model (8), used to construct the value relevance measurements. Finally, we present relevant descriptive statistics.

4.1 Sample Selection

The sample selection consisted of several steps. First, we removed firms in the industries Bank, Financial Services and Nonlife Insurance as classified by DataStream, since they use deviating accounting principles compared to firms in other industries. Secondly, to avoid duplicates, we removed the least traded share for firms with both A- and B-shares. For most firms, this was the B-share. Thirdly, we removed firms following GAAP for the entire time period. For firms that transitioned to IFRS during the time period, we blanked the observations that were not reported according to IFRS. Finally, we removed firms that we could not get the necessary data for (missing variables). After the sample selection, we ended up with 212 firms and 1640 firm-year observations.

4.2 Collected Variables

Table 4-1 presents the variables used in this master thesis. In *Panel A* and *Panel B*, we present the variables used in the main tests in *Chapter 5*, for price regression model (6) and time regression models (2-5) respectively. In *Panel C* and *Panel D*, we present the variables used in the robustness tests in *Chapter 6*, for the return regression model and abnormal return regression model respectively. The Bloomberg fields/DataStream codes used are stated in parenthesis. For the variables we calculated ourselves, the method is explained.

Table 4-1: Variables Used in Main Tests and Robustness Tests

Variable and calculation method	**Description of variable**
Panel A: Variables for the Price Regression Model (6)	
MVE_{it} (PX_LAST)	Market value of equity per share is the share price at the end of year *t* for firm *i*.
$EPS_{it} = \frac{Net\ income(EARN\_FOR\_COMMON)}{Number\ of\ shares\ (BS\_SH\_OUT)}$	Earnings per share is calculated using net income available to common shareholders, meaning net income after total cash preferred dividend and other adjustments, and number of shares outstanding (common stock) for firm *i* at the end of year *t*.
$BVPS'_{it-1} = BVPS_{it}\ (BOOK\_VAL\_PER\_SH) - EPS_{it}$	Book value per share adjusted is given by book value of equity per share at the end of year *t* minus earnings per share at the end of year *t* for firm *i*.
Panel B: Variables for the Time Regression Models (2-5)	
$TIME_t = 1, 2, .., 13$	Time trend is a proxy for the effect of IFRS over time, as the original standards have changed, on the value relevance of accounting information over time.
$INTANTEN_t = \frac{\sum_{i=1}^{I} INTAN_t}{\sum_{i=1}^{I} ASSETS_t\ (BS\_TOT\_ASSET)}$ $INTAN_{it} = TOT\_INTAN_{it}\ (BS\_DISCLOSED\_INTANGIBLES) - GW_{it}\ (BS\_GOODWILL)$	Intensity of intangible assets is calculated using sum of intangible assets and sum of total assets for all firms at the end of year *t*. Intangible assets is calculated as total intangible assets minus goodwill.[17]
$FAIR_t = \frac{\sum_{i=1}^{I} FINANCIAL\ ASSETS_t}{\sum_{i=1}^{I} ASSETS_t\ (BS\_TOT\_ASSET)}$	Intensity of financial assets is calculated using the sum of financial assets and the sum of total assets for all firms at the end of year *t*. The calculation of *FINANCIAL ASSETS* is presented in *Appendix B.5*.
$SIZE_t = log(\frac{\sum_{i=1}^{I} MV_{t-1}\ (HISTORICAL\_MARKET\_CAP)}{Number\ of\ firms_{t-1}})$	Firm size is a proxy for risk factors, measured by the logarithm of the previous year's mean market value of equity. Historical market capitalization is given by the number of shares outstanding and the market value of equity at year-end.
$LOSSTEN_t = \frac{\sum_{i=1}^{I} LOSS_t}{Number\ of\ firms_t}$ $LOSS_t = 1$ *if Net income(EARN_FOR_COMMON)* < 0 $LOSS_t = 0$ *if Net income(EARN_FOR_COMMON)* > 0	Intensity of losses is calculated using a dummy for negative net income and the number of firms at the end of year *t*.

[17] Goodwill is excluded as this asset is out of the scope of IAS 38 *Intangible Assets*.

$MRET_t = \frac{\sum_{m=1}^{M}(Return_{mt} - risk\ free\ rate_{mt})}{12}$ $Return_{mt}$ = *(PCH#(OSLOBMI(RI),1M))* $Risk\ free\ rate_{mt} = NWIKB3M * (1 - tax_t) * (1 - 0.05)$ *m* is month (*m=1, .., 12*)	Excess market return is the mean of end-month excess return of the equally weighted stock market index on OSE (OSEBX) above risk-free rate at the end of year *t*. The risk-free rate is calculated as the three months effective NIBOR rate (the interbank rate in Norway), adjusted for yearly tax rate and 5% risk premium.[18]
$MVOL = \frac{St.Dev\ (\sum_{m=1}^{M}(Return_{mt} - risk\ free\ rate_{mt})}{12}$	Market volatility is calculated as the standard deviation of the mean monthly excess return of OSEBX above risk-free rate at the end of year *t*.
Panel C: Variables for the Return Regression Model	
$R_{it} = \frac{\Delta MVE_{it} + DIV_{it}(EQY\_DPS)}{MVE_{it-1}} - risk\ free\ rate_t$	Return is the 12-month excess stock return of firm *i* measured from the end of year *t-1* to the end of year *t*. Yearly risk-free rate is calculated similarly to the monthly risk-free rate in *Panel B.*
$EPSDEF_{it} = \frac{EPS_{it}}{MVE_{it-1}}$	Earnings per share deflated for firm *i* in year *t* is calculated as earnings per share at the end of year *t* divided by market value of equity at the end of year *t-1*. *EPS* and *MVE* are as in *Panel A* When necessary, MVE_{it-1} and EPS_{it} are adjusted for stock split (*EQY_SPLIT_RATIO* and *EQY_SPLIT_DT*).
$\Delta EPSDEF_{it} = \frac{EPS_{it} - EPS_{it-1}}{MVE_{it-1}}$	Changes in earnings per share deflated for firm *i* in year *t* is given by earnings per share deflated at the end of year *t* minus earnings per share deflated at the end of year *t-1*. This variable is also used in the abnormal return regression, serving as a proxy for the surprise element in reported earnings.
Panel D: Variables for the Abnormal Return Regression Model	
$AR_{it} = \frac{\Delta MVE_{it} + DIV_{it}}{MVE_{it}} - cost\ of\ equity(WACC\_COST\_EQUITY)$	Abnormal return is the 12-month stock return of firm *i* measured from the end of year t-1 to the end of year *t* less the expected return. Expected return equals the cost of equity of firm *i* at the end of year *t*. Cost of equity is calculated using the Capital Asset Pricing Model (CAPM), where risk-free rate is the 10-year bond rate in Norway.

[18] The risk premium is set to 5% as this is the estimated risk premium by PwC over the time period 2011-2017 (PwC, 2013, 2014, 2016, 2017).

4.3 Winsorizing

Winsorizing involves replacing the most extreme values in the pooled sample with the observations closest to them. We have winsorized MVE, EPS, $BVPS$ and $BVPS'$ over 99.5 percentile and below 0.5 percentile in accordance with Gjerde et al. (2011). We only replace 1% (0.5% for each tail) since we have a limited data sample.[19]

16 observations per variable (upper and lower), 64 in total, for 21 different firms was replaced with their respective percentile value. The number of firm-year observations is unchanged.

4.4 Constructing the Value Relevance Measurements

To construct the VRM-variables, we run the price regression model (6), the BVPS′-model (7) and the EPS-model (8) for each year (2005-2017) to obtain the annual value relevance measurements. Each annual value relevance measurement will be used as the dependent variable in the time regression models (2-5). The results from running the price regression model (6), the BVPS′-model (7) and the EPS- model (8) are presented in *Table 4-2*.

Table 4-2: Annual Regression Models

	Price regression model (6)			BVPS′-model (7)		EPS-model (8)		Incr. BVPS′	Incr. EPS
Year	β_1	β_2	R^2_T	γ_1	R^2_5	δ_1	R^2_6	$R^2_{BVPS'}$	R^2_{EPS}
2005	1.40***	2.03	0.46	1.86***	0.46	7.07***	0.41	0.05	0.00
	(0.48)	(2.79)		(0.23)		(1.56)			
2006	1.42***	3.23**	0.58	1.96***	0.54	7.11***	0.43	0.15	0.05
	(0.31)	(1.61)		(0.25)		(2.01)			
2007	1.34***	3.57	0.65	1.98***	0.62	8.78***	0.56	0.09	0.03
	(0.42)	(3.02)		(0.22)		(2.38)			
2008	1.35***	0.39	0.71	1.34***	0.71	-4.60	0.09	0.62	0.00
	(0.42)	(1.28)		(0.44)		(4.44)			
2009	1.20***	2.73***	0.90	1.51***	0.87	8.48***	0.65	0.25	0.03
	(0.23)	(1.04)		(0.30)		(2.56)			
2010	0.95***	4.00***	0.92	1.48***	0.89	9.52***	0.84	0.08	0.03
	(0.15)	(1.34)		(0.23)		(1.87)			
2011	0.96***	4.11***	0.88	1.29***	0.83	10.31***	0.66	0.23	0.05
	(0.22)	(1.38)		(0.31)		(3.26)			
2012	0.72***	5.16***	0.91	1.38***	0.87	9.84***	0.87	0.04	0.04
	(0.23)	(1.60)		(0.28)		(1.59)			
2013	1.56***	-1.45	0.91	1.44***	0.90	8.05***	0.40	0.51	0.01
	(0.25)	(1.52)		(0.20)		(1.16)			
2014	1.43***	2.97*	0.82	1.63***	0.80	10.85*	0.44	0.38	0.02
	(0.30)	(1.75)		(0.34)		(6.12)			
2015	1.34***	2.50***	0.80	1.52***	0.70	4.21	0.29	0.51	0.10
	(0.27)	(0.81)		(0.42)		(2.88)			

[19] We have performed a robustness test where we winsorized over the 99 percentile and below the 1 percentile, see *Section 6.4*.

2016	1.06***	4.52***	0.85	1.61***	0.74	8.41***	0.67	0.18	0.11
	(0.23)	(0.71)		(0.34)		(2.56)			
2017	1.24***	4.36***	0.88	1.69***	0.79	8.97***	0.62	0.26	0.09
	(0.20)	(1.24)		(0.36)		(3.15)			
Pooled	1.25***	2.91***	0.74	1.54***	0.70	7.44***	0.46	0.29	0.04
	(0.12)	(0.62)		(0.09)		(0.81)			

Robust standard errors in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. We correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. The constant is not reported. The price regression model (6) is $MVE_{it} = \beta_0 + \beta_1 BVPS'_{it-1} + \beta_2 EPS_{it} + \varepsilon_{it}$. The BVPS′-model (7) is $MVE_{it} = \gamma_0 + \gamma_1 BVPS'_{it-1} + \varepsilon_{it}$. The EPS-model (8) is $MVE_{it} = \delta_0 + \delta_1 EPS_{it} + \varepsilon_{it}$. R_T^2, R_7^2 and R_8^2 are R^2 from the price regression model (6), BVPS′-model (7) and EPS-model (8) respectively. Incremental explanatory power of BVPS′ (Incr. BVPS′) is calculated as the difference in adjusted R^2 for price regression model (6) and EPS-model (8), $R_{BVPS'}^2 = R_T^2 - R_8^2$. Incremental explanatory power of EPS (Incr. EPS) is calculated as the difference in adjusted R^2 for price regression model (6) and BVPS′-model (7). $R_{EPS}^2 = R_T^2 - R_7^2$. R^2 reported is the adjusted R^2.

In the annual price regression model (6), the response coefficient for $BVPS'$ (BRC (β_1)) is highly significant (1% significant level). The response coefficient for EPS (ERC (β_2)) is at least weakly significant (10% significant level) in all years besides 2005, 2007, 2008 and 2013. For BRC and ERC, the means are 1.23 and 2.93, and the medians are 1.34 and 3.23 respectively, meaning that the empirical distributions are skewed to the left (see *Table 4-4*). The standard deviations for ERC are relatively large. The total explanatory power of book value of equity and earnings, R_T^2, is at its highest in 2010 (92%), and its lowest in 2005 (46%). The mean R_T^2 is 79%.

In the pooled price regression model (6), BRC is 1.25, meaning that a 1 NOK increase in $BVPS'$ is associated with a 1.25 NOK increase in MVE, ceteris paribus. ERC is 2.91, meaning that a 1 NOK increase in EPS is associated with a 2.91 NOK increase in MVE, ceteris paribus. Both $BVPS'$ and EPS are highly significant in the pooled price regression model (6). Further, the total explanatory power, R_T^2, is 0.74, meaning that 74% of the cross-sectional variation in MVE can jointly be explained by $BVPS'$ and EPS.

When controlling for industry fixed-effects (IND) in the pooled price regression model (6), R_T^2 increases to 78%, see *Appendix B.1*. We test if all industries are jointly significant in the price regression model (6) by performing a standard F-test, see e.g., Greene (2008, pp. 89-90). Looking at the pooled price regression model (6), we find that at least one industry response coefficient is significantly different from zero. However, looking at all the annual price regression models (6), we fail to reject the null hypotheses that all sub-populations follow the same regression model (that the restricted model is true) in 2005, 2006, 2013 and 2015. Since we fail to reject that the price regression model (6) without industry fixed-effects is the true model in 4 out of 13 years, we continue to use price regression model (6) going forward.

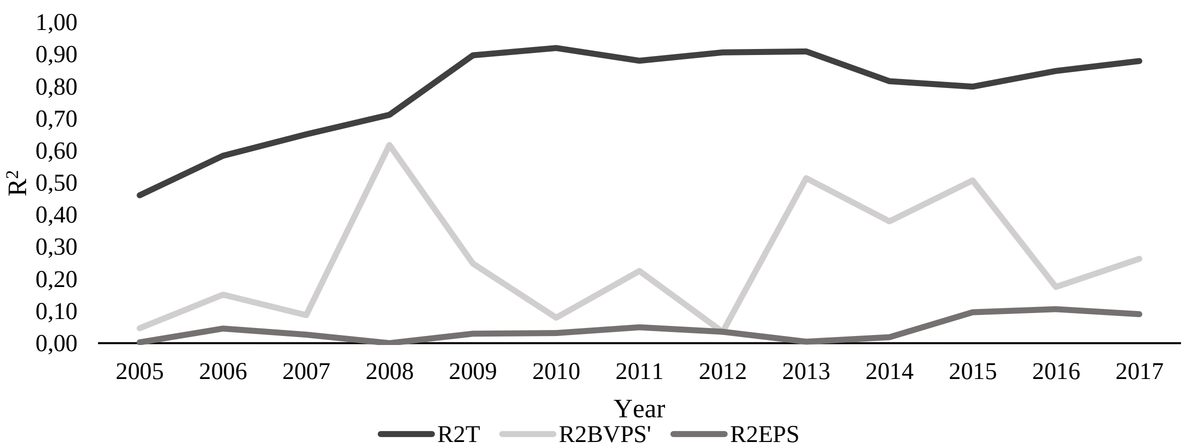
In the BVPS′-model (7), the response coefficient is highly significant throughout the time period. In the EPS-model (8) the response coefficient is highly significant in all years besides 2008 and 2015, where it is insignificant, and in 2014, where it is only weakly significant. A higher response coefficient (absolute value) implies that MVE is more sensitive to this accounting variable. The development in the response coefficient in the BVPS′-model (7) has been relatively stable through the time period, with a big drop in 2008, and smaller drops in 2011 and 2015. The development in the response coefficient in the EPS-model (8) is more volatile, with larger drops in 2008 and 2015, and a small drop in 2013.

The marginal increase in R^2 due to the inclusion of $BVPS'$, the incremental explanatory power of BVPS′ (Incr. BVPS′), is never lower than the incremental explanatory power of EPS (Incr. EPS). The Incr. BVPS′ is at its highest in 2008 (62%), and its lowest in 2012 (4%). The mean of $R^2_{BVPS'}$ is 26%. The Incr. EPS is the marginal increase in R^2 due to the inclusion of EPS, and is it its lowest in 2008 (0%) and is at its highest in 2016 (11%). The mean of R^2_{EPS} is 4%.

The mean common R^2 for EPS and $BVPS'$ is 49% (=79%-26%-4%). The common R^2 is the R^2 without the marginal contribution of EPS and $BVPS'$. In the cross-sectional variation in market value of equity, $BVPS'$ explains most of the variation, see *Appendix B.2*.

Figure 4-1 illustrates the development in total explanatory power (R^2_T) and incremental explanatory power of $BVPS'$ ($R^2_{BVPS'}$) and EPS (R^2_{EPS}), unstacked, from 2005 to 2017.

Figure 4-1: Development in Total- and Incremental Explanatory Power of BVPS' and EPS



R2T is R^2_T, R2BVPS' is $R^2_{BVPS'}$, and R2EPS is R^2_{EPS}.

Figure 4-1 shows that the Incr. BVPS′ is volatile, and when tested for, we find no significant trend (p-value=0.29). The Incr. EPS shows a highly significant positive trend (p-value=0.01). The total explanatory power (R_T^2) has been steadily increasing over the time period, with a drop in 2011, 2014 and 2015. Regressing R_T^2 on the time-trend variable reveals that the positive trend is significant (p-value=0.021),[20] consistent with the findings of e.g., Collins et al. (1997).

Notably from *Figure 4-1* is the increase in Incr. BVPS′ in 2008. This is as expected, given the financial crisis in 2008, as findings of Barth et al. (1998) indicated that when financial health decreases, the incremental explanatory power of book value of equity increases, and the incremental explanatory power of earnings decreases. At the same time, our result with ERC being insignificant and R_{EPS}^2 decreasing in 2008, is inconsistent with Beisland (2013), who found that ERC from a price regression model increases significantly under the financial crisis. Beisland claimed that book value of equity and earnings have different information content in 2008, and we, therefore, analyze this relationship. We find that $BVPS'$ and EPS is positively correlated in all years except 2008, when the correlation is negative, supporting Beisland. Finally, it is worth mentioning that the total R^2 (R_T^2) do not drop in 2008, which is consistent with the findings of Beisland.

4.5 Descriptive Statistics

In the following, we present relevant descriptive statistics. First, we present summary statistics. Secondly, we present correlation matrices.

4.5.1 Summary Statistics

Table 4-3 shows number of firms per year in our data sample.

Table 4-3: Number of Firms per Year

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Firms	118	125	138	140	134	132	137	132	125	120	116	116	107

The number of firms is not constant because of firms entering and exiting OSE. The highest number of firms is in 2008 (140) and the lowest number of firms is in 2017 (107). Total firm-year observations is 1640.

[20] Corrected for first-order autocorrelation using Newey-West standard errors.

Table 4-4 presents the summary statistics, where *Panel A* contains the variables used in the price regression model (6), while *Panel B* contains the variable used in the time regression models (2-5).

Table 4-4: Summary Statistics for Variables Used in the Price Regression Model (6) and Time Regression Models (2-5)

Variable	N	Mean	St.Dev	min	p25	Median	p75	max
Panel A: Price Regression Model (6) Variables								
MVE	1640.00	67.20	184.44	0.20	4.96	22.50	60.00	1800.00
BVPS	1640.00	46.92	114.77	-2.28	3.98	15.23	14.65	1054.52
BVPS′	1640.00	42.80	99.81	-0.71	4.20	15.10	39.48	875.10
EPS	1640.00	3.74	16.78	-50.18	-0.65	0.39	4.14	127.23
P/B	1612.00	2.60	6.79	0.02	0.76	1.42	2.61	419.15
P/E	980.00	57.02	469.94	0.15	7.85	13.21	23.81	13656.36
Panel B: Time Regression Models (2-5) Variables								
R^2_T	13.00	0.79	0.15	0.46	0.71	0.85	0.90	0.92
$R^2_{BVPS'}$	13.00	0.26	0.19	0.04	0.09	0.22	0.38	0.62
R^2_{EPS}	13.00	0.04	0.04	-0.00	0.02	0.03	0.05	0.11
R^2_{COMMON}	13.00	0.49	0.21	0.09	0.39	0.53	0.60	0.83
BRC	13.00	1.23	0.24	0.72	1.06	1.34	1.40	1.56
ERC	13.00	2.93	1.81	-1.45	2.50	3.23	4.11	5.16
TIME	13.00	7.00	3.89	1.00	4.00	7.00	10.00	13.00
INTANTEN	13.00	0.07	0.01	0.05	0.07	0.08	0.08	0.09
FAIR	13.00	0.14	0.01	0.12	0.13	0.13	0.14	0.16
SIZE	13.00	3.62	1.10	0.00	3.90	3.94	4.00	4.09
LOSSTEN	13.00	0.25	0.03	0.19	0.23	0.25	0.28	0.30
MRET	13.00	-0.01	0.03	-0.10	-0.01	-0.00	0.01	0.03
MVOL	13.00	0.05	0.03	0.02	0.03	0.04	0.05	0.13

N is the number of observations per variable (all years). Mean is the sample average. St. Dev is the standard deviation. p25 is the 25 percentile, Median is the 50 percentile and p75 is the 75 percentile. Min is the lowest observation, while Max is the highest observation. In *Panel A*, *MVE* is market value of equity per share, *BVPS* is book value per share, $BVPS'$ is book value per share adjusted, *EPS* is earnings per share, *P/B* is the price/book ratio with *BVPS*>0, and *P/E* is the price/earnings ratio with *EPS*>0. In *Panel B*, R^2_T, $R^2_{BVPS'}$, R^2_{EPS}, and R^2_{COMMON} are from *Table 4-2*. *BRC* is the response coefficient for $BVPS'$ (β_1) and *ERC* is the response coefficient of *EPS* (β_2) from the annual price regression model (6). *TIME* is the time trend, *INTANTEN* is the intensity of intangible assets, *FAIR* is the intensity of financial assets, *SIZE* is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, *LOSSTEN* is the intensity of losses, *MRET* is the mean of end-month return on OSEBX above risk-free rate per year and *MVOL* is market volatility.

Panel A shows that the mean market value of equity (*MVE*) is NOK 67.20, book value per share (*BVPS*) is NOK 46.92, book value per share adjusted ($BVPS'$) is NOK 42.80 and earnings per share (*EPS*) is NOK 3.74. Since the median is lower than the mean for the mentioned variables, the empirical distributions for *MVE*, *BVPS*, $BVPS'$ and *EPS* are skewed to the right. Since the variables' standard deviations are relatively large, the median is a more appropriate indicator than the mean for the center of the distributions. For statistics on variables used to calculate *EPS*, see *Appendix B.3*. *P/B* and *P/E* are not variables used in the price regression model (6); however, they are included because they are informative. P/B and P/E are also skewed to the right, with a median of 1.42 and 13.21 respectively. This is as expected.

In *Panel B* we first show summary statistics for the six value relevance measurements, the VRM-variables from *Table 4-2.* The empirical distribution for R_T^2 is skewed to the left, with a median of 85%. The lowest observation for R_{BVPS}^2, is 4%, while the lowest observation for R_{EPS}^2 is 0%. The highest observation for R_{BVPS}^2, is 62%, while the highest observation for R_{EPS}^2 is 11%. For R_{COMMON}^2, the mean is 49%, the lowest observation is 9% and the highest observation is 83%.

For the two explanatory variables, $INTANTEN$ and $FAIR$, the means are 7% and 14%, and the medians are 8% and 13% respectively. This implies that the empirical distribution for $INTANTEN$ is skewed to the left, while that the empirical distribution for $FAIR$ is skewed to the right. The lowest observations for $INTANTEN$ and $FAIR$ are 5% and 12%, while the highest observations are 9% and 16% respectively. For statistics on variables used to calculate $INTANTEN$ and $FAIR$, see *Appendix B.5.*

Further, for the control variables ($CONT$) in *Panel B*, we find that the mean market excess return ($MRET$) is negative, while the median is zero. The mean market volatility ($MVOL$) is 5%. The mean loss intensity ($LOSSTEN$) is 25%, meaning that ¼ of the earnings observations in our data sample are negative. The mean of $LOSSTEN$ equals the median (25%), meaning that the empirical distribution for $LOSSTEN$ is symmetric. For statistics on variables used to calculate $LOSSTEN$, see *Appendix B.4*. Since the firm size ($SIZE$) is the logarithm of the market capitalization, the corresponding mean market capitalization over our 13 years of data is about NOK 40 ($= e^{3.62}$) millions.

4.5.2 Correlation Matrices

Pearson Correlation Coefficient is used to measure the degree of linear relationship between two variables. In the following, we first present the correlation matrix for the price regression model (6), then the correlation matrix for the time regression models (2-5).

Price Regression Model

The pairwise correlation between the variables used in the price regression model (6) are presented in *Table 4-5.*

Table 4-5: Pearson Correlation Matrix for Variables Used in the Price Regression Model (6)

Variable	MVE	BVPS	BVPS'	EPS
MVE	1.00	0.86***	0.87***	0.68***
BVPS		1.00	0.99***	0.68***
BVPS′			1.00	0.61***
EPS				1.00

The stars represent the p-value, where * p<0.10, ** p<0.05, *** p<0.01. MVE is the market value of equity per share. $BVPS$ is book value of equity. $BVPS'$ is the adjusted book value of equity. EPS is earnings per share.

Table 4-5 shows a highly significant and positive correlation between MVE and $BVPS'$ and between MVE and EPS at 87% and 68% respectively. In other words, adjusted book value of equity (earnings) seems to explain 87% (68%) of the pooled variation in the market value of equity. This is as expected. There is also a highly significant and positive correlation between $BVPS'$ and EPS at 61%. The correlation between $BVPS$ and $BVPS'$ is naturally close to perfect (99%). One can also see that the correlation between $BVPS'$ and EPS (61%) is lower than between $BVPS$ and EPS (68%). This is because EPS is included in $BVPS$, see *Section 3.2.*

Time Regression Models

Table 4-6 presents pairwise correlations between the variables used in the time regression models (2-5).

Table 4-6: Pearson Correlation Matrix for Variables Used in the Time Regression Models (2-5)

Variable	TIME	INTANTEN	FAIR	SIZE	LOSSTEN	MRET	MVOL
R^2_T	0.70***	0.35	0.24	0.70***	0.04	0.13	-0.18
$R^2_{BVPS'}$	0.32	0.49	-0.48	0.37	-0.21	-0.47	0.28
R^2_{EPS}	0.70**	-0.07	-0.02	0.35	0.26	0.28	-0.46
R^2_{COMMON}	0.08	-0.20	0.61**	0.09	0.17	0.47	-0.31
BRC	-0.18	-0.13	-0.55**	-0.22	-0.43	-0.03	-0.06
ERC	0.12	-0.30	0.41	0.15	0.52	0.25	-0.30
TIME	1.00	0.36	-0.10	0.53	-0.07	0.19	-0.51
INTANTEN		1.00	0.08	-0.09	-0.15	-0.17	0.29
FAIR			1.00	-0.24	-0.19	0.24	0.00
SIZE				1.00	0.37	-0.27	-0.04
LOSSTEN					1.00	-0.29	0.35
MRET						1.00	-0.74***
MVOL							1.00

The stars represent the p-value, where * p<0.10, ** p<0.05, *** p<0.01. R^2_T, $R^2_{BVPS'}$, $R^2_{EPS,}$ and R^2_{COMMON} are from *Table 4-2*. BRC is the response coefficient for $BVPS'$ (β_1) and ERC is the response coefficient for EPS (β_2) from the price regression model (6). The correlations between the value relevance measurements are not shown. $TIME$ is the time trend, $INTANTEN$ is the intensity of intangible assets, $FAIR$ is the intensity of financial assets, $SIZE$ is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, $LOSSTEN$ is the intensity of losses, $MRET$ is the mean of end-month return on OSEBX above risk-free rate per year and $MVOL$ is market volatility.

Table 4-6 shows a highly significant and positive correlation between R^2_T and $TIME$ (70%), and between R^2_T and $SIZE$ (70%). The correlation between R^2_{EPS} and $TIME$ is significant (5% significance level) and positive (70%). R^2_{COMMON} is significant and positive correlated with $FAIR$ (61%). BRC is significant and negative correlated with $FAIR$ (-55%). Further, *Table 4-6* shows a highly significant and negative correlation between $MRET$ and $MVOL$ (-74%). We expected $MRET$ and $MVOL$ to be correlated since theoretical financial asset-price models link the relationship between a security's return and volatility. However, whether the relationship is positive or negative is a controversial topic, and there is no agreement on whether the relationship between excess market return and market volatility is positive or negative across time (Li, Yang, Hsiao, & Chang, 2005). On the one hand, investors generally require a larger expected return if the security is riskier (higher volatility). On the other hand, in accordance with our finding, Bekaert and Wu (2000) claim that the relationship is asymmetric and that the market returns and conditional volatility are negatively correlated. When the volatility increases, the risk increases and, therefore, the return decreases.

Since only $MVOL$ and $MRET$ of the independent variables ($CONT$ and EXP) are correlated, multicollinearity does not seem to be a notable problem. This will be further discussed in *Section 6.2*

5. Results

In this chapter, we test our hypotheses using the time regression models (2-5) derived in *Chapter 3*. The results from running the price regression model (6), the BVPS$'$-model (7) and the EPS-model (8) are presented in *Section 4.4* and used to construct the six VRM-variables entering in the time regression models (2-5).

To test hypotheses 1 and 3, *the total value relevance of accounting information in Norway has increased over time after the transition to IFRS, associated with increased recognition of intangible assets and extent of fair value accounting,* we use the annual total explanatory power from the price regression model (6) as the VRM-variable in the time regression models (2-5).

To test hypotheses 2 and 3, *the value relevance of book value of equity has increased, and the value relevance of earnings has decreased, in Norway over time after the transition to IFRS, associated with increased recognition of intangible assets and extent of fair value accounting,* we use the Incr. BVPS$'$ and Incr. EPS from *Table 4-2*, and the BRC and ERC from the annual price regression model (6) as the VRM-variables in the time regression models (2-5).

This chapter is organized as follows. First, we present the results from the time regression models (2-5) with different *VRM*-variables. Secondly, based on these results, we decide whether our results are consistent or inconsistent with our hypotheses.

5.1 Results from Time Regression Models

The results from running the time regression models (2-5) with different *VRM*-variables are presented in *Table 5-1* and *Table 5-2.* In the following sections, we first discuss hypothesis 1, then hypothesis 2. For both hypotheses, we seek to determine if the changes in value relevance over time, if any, is associated with increased recognition of intangible assets and extent of fair value accounting, consistent with hypothesis 3.

5.1.1 Hypotheses 1 and 3

In this section, we seek to test hypotheses 1 and 3. We test these by using the annual total R^2 (R_T^2) from price regression model (6) as the *VRM*-variable in the time regression models (2-5). We examine what effect, if any, including the control variables and the explanatory variables have on the significance of *TIME.*

The results are presented in *Table 5-1*.[21]

Table 5-1: Time Regression Models with Total R^2 as VRM – Regressions A

	Total R^2 from price regression model (6) as VRM			
Variable	**2-A**	**3-A**	**4-A**	**5-A**
TIME	0.03**	0.02**	-0.22	0.16
	(0.01)	(0.01)	(0.22)	(0.15)
TIME*INTANTEN			1.49	-1.30
			(2.61)	(1.51)
TIME*FAIR			1.00	-0.56
			(1.17)	(0.43)
INTANTEN			-3.26	10.68
			(8.14)	(8.24)
FAIR			-0.55	6.77*
			(7.48)	(2.46)
SIZE		0.09***		0.14**
		(0.01)		(0.04)
LOSSTEN		-1.06		-0.06
		(0.73)		(0.99)
MRET		3.06***		1.51
		(0.58)		(0.95)
MVOL		3.67***		-0.84
		(0.98)		(2.50)

[21] We have corrected for first-order autocorrelation. However, our results are robust to second- and third-order autocorrelation as well, with virtually identical results.

R^2	0.45	0.65	0.33	0.92

Standard errors are in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The constant is not reported. Regression 2 is time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regression 3 is time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regression 4 is time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regression 5 is time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. VRM is the annual total explanatory power (R_T^2) from the price regression model (6). $TIME$ is the time trend. EXP consists of $INTANTEN$ and $FAIR$, where $INTANTEN$ is the intensity of intangible assets and $FAIR$ is the intensity of financial assets. $CONT$ consists of $SIZE$, $LOSSTEN$, $MRET$ and $MVOL$, where $SIZE$ is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, $LOSSTEN$ is the intensity of losses, $MRET$ is the mean of end-month return on OSEBX above risk-free rate per year, and $MVOL$ is market volatility. All regressions have been corrected for first-order autocorrelation (and heteroscedasticity) using Newey-West standard errors, which all the p-values are based on, developed by Newey and West (1987). Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

In the first regression, regression 2-A, the response coefficient for $TIME$ is significant positive. The explanatory power is 45%. Adding the control variables in the second regression, 3-A, do not render $TIME$ insignificant in explaining the variation in total R^2 (R_T^2). Further, in regression 3-A, the response coefficient for $SIZE$ is highly significant and positive. The interpretation for $SIZE$ is that a one percentage change in $SIZE$ is associated with a 0.09 percentage points change in the VRM-variable, ceteris paribus. This implies that an increase (decrease) in mean firm size is associated with higher (lower) total value relevance of accounting information. This finding is consistent with Hayn (1995) and Collins et al. (1999), who stated that larger firms are less risky and less likely to report losses than smaller firms, and thereby, implied a positive relationship between value relevance and firm size. Further, the response coefficients for $MRET$ and $MVOL$ are highly significant and positive, which implies that an increase in either $MRET$ or $MVOL$ is associated with increased total value relevance, ceteris paribus. This is not as expected, as we in *Section 3.1* predicted the accounting information to be more value relevant when the stock market returns are low (or when less market volatility), and, therefore, that the excess market return (or market volatility) was negatively associated with total value relevance.

In regression 4-A, we add the explanatory variables. Now $TIME$ is negative but insignificant. In addition, none of the explanatory variables are significant. Consequently, regression 4-A provides no evidence of the increased value relevance over time, as found in the regressions (2-3)-A, being associated with neither increased recognition of intangible assets nor extent of fair value accounting.

Finally, in regression 5-A, *TIME* is positive but insignificant. The only significant response coefficients are for *FAIR* and *SIZE*, and both are positive. *FAIR* is only weakly significant. This implies that an increase in either *FAIR* or *SIZE* is associated with an increase in the total value relevance, ceteris paribus. The interpretation for *SIZE* is as above. For *FAIR*, the interpretation is that a one percentage point increase in *FAIR* is associated with a 6.77 percentage point's increase in total value relevance, ceteris paribus. However, as discussed in *Section 3.1*, the interpretation for the fixed effect of *FAIR* (*INTANTEN*) is meaningless, as it is the effect of the extent of fair value accounting (recognition of intangible assets) on value relevance when *TIME* =0, which it never is.[22] Therefore, the interpretation for *FAIR* (and *INTANTEN*) will not be discussed in the following regressions. The explanatory power of regression 5-A is 92%.

5.1.2 Hypotheses 2 and 3

In this section, we test hypotheses 2 and 3. We test these by using the Incr. BVPS′ ($R^2_{BVPS'}$) and Incr. EPS (R^2_{EPS}) from *Table 4-2*, and the *BRC* and the *ERC* from the annual price regression model (6) as the *VRM*-variables in the time regression models (2-5). The results with $R^2_{BVPS'}$ and R^2_{EPS} as the *VRM*-variable are presented in *Table 5-2*.[21] We examine what effect, if any, including the control variables and the explanatory variables, have on the significant of *TIME*.

Table 5-2: Time Regression Models with Incremental R^2 as VRM – Regressions B and C

	Incr. BVPS′ as VRM				**Incr. EPS as VRM**			
Variable	**2-B**	**3-B**	**4-B**	**5-B**	**2-C**	**3-C**	**4-C**	**5-C**
TIME	0.02	0.02	-0.15	-0.45	0.01**	0.01**	-0.02	-0.12
	(0.01)	(0.02)	(0.32)	(0.20)	(0.00)	(0.00)	(0.04)	(0.06)
TIME*INTANTEN			-1.52	-0.00			0.33	2.18**
			(3.70)	(2.43)			(0.43)	(0.63)
TIME* FAIR			1.95	3.51**			0.01	-0.14
			(1.44)	(0.76)			(0.31)	(0.22)
INTANTEN			14.38	4.02			-2.16	-11.69**
			(11.67)	(12.59)			(1.48)	(3.13)
FAIR			-21.69**	-31.06**			0.51	2.94
			(8.69)	(6.31)			(1.68)	(1.57)
SIZE		0.05		0.02		-0.00		-0.04*
		(0.05)		(0.06)		(0.01)		(0.01)
LOSSTEN		-3.22*		-4.86*		0.51		0.23
		(1.67)		(1.72)		(0.32)		(0.32)
MRET		-1.52		0.86		0.07		0.43
		(2.75)		(1.80)		(0.22)		(0.42)
MVOL		3.81		5.12		-0.35		2.23*
		(3.74)		(4.07)		(0.32)		(0.94)

[22] *TIME* is the time trend, and it goes from 1-13. 1 being 2005 and 13 being 2017.

R^2	0.02	0.58	0.54	0.93	0.40	0.34	0.24	0.60

Robust standard errors are in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The constant is not reported. Regressions 2 are time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regressions 3 are time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regressions 4 are time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regressions 5 are time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. *VRM* is $R^2_{BVPS'}$ for regressions B, and R^2_{EPS} for regressions C from *Table 4-2*. *TIME* is the time trend. *EXP* consists of *INTANTEN* and *FAIR*, where *INTANTEN* is the intensity of intangible assets and *FAIR* is the intensity of financial assets. *CONT* consists of *SIZE*, *LOSSTEN*, *MRET* and *MVOL*, where *SIZE* is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, *LOSSTEN* is the intensity of losses, *MRET* is the mean of end-month return on OSEBX above risk-free rate per year, and *MVOL* is market volatility. None of the above regressions tested positive for autocorrelation, and, therefore, they were not corrected for first-order autocorrelation. We correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

Regressions B analyze whether the value relevance of book value of equity has increased or decreased over time, where Incr. BVPS′ ($R^2_{BVPS'}$) is the *VRM*-variable. In the first regression, regression 2-B, the response coefficient for *TIME* is insignificant and the explanatory power is only 2%. In regression 3-B, the only significant response coefficient is for *LOSSTEN.* The response coefficient for *LOSSTEN* is weakly significant and negative, indicating that an increase in the intensity of losses is associated with a decrease in the value relevance of book value of equity, ceteris paribus. This is in contrast with Barth et al. (1998), who suggested that the value relevance of book value of equity increases, at the expense of earnings, when earnings are negative. The explanatory power is 58%. Further, in regression 4-B, *FAIR* is significant and negative, while none of the other response coefficients are significant.

Finally, in regression 5-B, *TIME*FAIR, FAIR* and *LOSSTEN* are significant. While *FAIR* and *LOSSTEN* are negative, the *TIME*FAIR* is positive. *LOSSTEN* is only weakly significant. The partial change in the value relevance of book value of equity because of the time trend is: $\frac{\partial VRM}{\partial TIME} = -0.45 - 0.00 * INTANTEN + 3.51 * FAIR$. Note that *TIME* and *TIME*INTANTEN* are insignificant, and will, therefore, not be commented. *TIME*FAIR* being significant and positive implies that the value relevance of book value of equity increases over time as the extent of fair value accounting increases. This is as we expected in *Section 3.1* and can be tied to the changes to IFRS, see *Section 2.3*. Finally, as *FAIR* and *FAIR*TIME* are jointly significant at a 5% significance level (p-value=0.04),[23] the net effect of an increase in the extent of fair

[23] By performing a standard F-test, see e.g. Greene (2008, pp. 89-90).

value accounting when $TIME \geq 9$ (2013) is associated with increased value relevance of book value of equity, ceteris paribus. The explanatory power of regression 5-B is 93%.

Moreover, regressions C analyze whether the value relevance of earnings has increased or decreased over time, where Incr. EPS (R^2_{EPS}) is the *VRM*-variable. In regression 2-C, the response coefficient for *TIME* is significant positive, meaning that an increase in *TIME* is associated with an increase in the value relevance of earnings. The explanatory power is 40%. In regression 3-C, the response coefficient for *TIME* is still significant positive. None of the other response coefficients are significant. The explanatory power is 34%. Further, in regression 4-C, none of the response coefficients are significant.
Finally, in regression 5-C, *TIME*INTANTEN* and *INTANTEN* and are significant, while *SIZE* and *MVOL* are weakly significant. *SIZE* is negative, implying that an increase in the mean market value of equity is associated with a decrease in the value relevance of earnings, which is not as expected in *Section 2.2.1* and the opposite of the evidence for total value relevance in *Table 5-1*. *MVOL* is positive, which implies that an increase in the market volatility is associated with an increase in the value relevance of earnings, similar to the evidence for total value relevance in *Table 5-1*. Moreover, the partial change in value relevance of earnings because of the time trend is: $\frac{\partial VRM}{\partial TIME} = -0.12 + 2.18 * INTANTEN \; - 0.14 * FAIR$. Note that *TIME* and *TIME*FAIR* are insignificant, and will, therefore, not be commented. *TIME*INTANTEN* being significant and positive implies that the value relevance of earnings increases over time when the recognition of intangible assets increases. This is as expected in *Section 2.3* and *3.1* as recognition of intangible assets leads to better matching between investments and future revenues and can be tied to the changes to IFRS (Dichey & Tang, 2008; Beisland & Knivsflå, 2015). Thereby, the positive time trends in regressions (2-3)-C are associated with increased recognition of intangible assets from regression 5-C. Finally, as *TIME*INTANTEN* and *INTANTEN* are jointly significant at a 10% significance level (p-value =0.07),[23] the net effect of an increase in recognition of intangible assets when $TIME \geq 6$ (2010) is associated with increased value relevance of earnings, ceteris paribus. The explanatory power of regression 5-C is 60%.

We have not tabulated the time regression models (2-5) with BRC, ERC or R^2_{COMMON} as VRM-variables.[24] Using BRC or R^2_{COMMON} as the VRM-variable do not provide any significant results. This implies that using BRC, compared to using Incr. BVPS$'$, as the VRM-variable, strengthens the result of no evidence of increased value relevance of book value of equity over time. Further, it strengthens the result of increased recognition of intangible assets not affecting, while it weakens the result of increased extent of fair value accounting having a positive contribution to the value relevance of book value of equity over time. Using ERC as the VRM-variable do not provide any significant results regarding the time trend, which supports the findings from using Incr. EPS as the VRM-variable, namely no evidence of decreased value relevance of earnings over time. Finally, using ERC as the VRM-variable strengthens the result of the increased extent of fair value accounting not affecting, while it weakens the result of increased recognition of intangible assets having a positive contribution to, the value relevance of earnings over time.

5.2 Conclusions from Main Tests

5.2.1 Hypotheses 1 and 3

To conclude, our main tests show evidence of increased total value relevance of accounting information in Norway over time after the transition to IFRS. This is consistent with hypothesis 1, and Collins et al. (1997) and Gjerde et al. (2011).

Further, we find evidence of the positive time trend being supported by increased value relevance of earnings over time, which is found to be associated with increased recognition of intangible assets. Increased extent of fair value accounting is found to contribute to increased value relevance of the book value of equity over time. This is consistent with hypothesis 3.

5.2.2 *Hypotheses 2 and 3*

For book value of equity, we cannot conclude with increased value relevance in Norway over time after the transition to IFRS. This is inconsistent with the first part of hypothesis 2. Furthermore, we do find evidence of increased extent of fair value accounting contributing to an increased value relevance of book value of equity over time. This is consistent with

[24] The time regression models (2-5) with BRC as the VRM -variable are called regressions B-2. The time regression models (2-5) with ERC as the VRM-variable are called regressions C-2. Finally, the time regression models (2-5) with R^2_{COMMON} as the VRM-variable are called regressions D.

hypothesis 3, and e.g., Barth et al. (1996) and Beisland and Knivsflå (2015). Note that since we cannot conclude with increased value relevance of book value of equity over time, there must be a negative effect that surpasses the positive effect of extent of fair value accounting, but that our time regression models (2-5) do not pick up, e.g., see *Section 6.2*. Finally, we find no evidence of increased recognition of intangible assets contributing (positive or negative) to the value relevance of book value of equity over time, inconsistent with hypothesis 3.

To conclude regarding earnings, we find no evidence of decreased value relevance of earnings over time. In fact, we find evidence of increased value relevance of earnings in Norway over time after the transition to IFRS. This is inconsistent with the second part of hypothesis 2, but consistent with Gjerde et al. (2011). Further, we find that this increase is associated with increased recognition of intangible assets over time, consistent with hypothesis 3, and the findings of Aboody and Lev (1998) and Gjerde et al. (2008). A possible explanation is that recognition of intangible assets has led to better matching between investments and future revenues (Dichey & Tang, 2008; Beisland & Knivsflå, 2015). Finally, we find no evidence of increased extent of fair value accounting contributing (positive or negative) the value relevance of earnings over time, inconsistent with hypothesis 3.

6. Robustness Tests

In this chapter, we perform several robustness tests to validate the results from *Chapter 5* and discuss econometric issues regarding our value relevance models. This chapter is organized as follows. First, we run the same regression models as in *Chapter 5*, using the market value of equity four months after year-end, instead of at year-end. Secondly, we discuss econometric issues regarding the value relevance models presented in *Chapter 3*. We start by addressing problems with heteroscedasticity and multicollinearity. Then, we discuss problems with autocorrelation. Thirdly, we run the same regression models as in *Chapter* 5, but with 2% winsorizing instead of 1%. Finally, we present and run a return regression model and an abnormal return regression model. An overview of the different *VRM*-variables is presented in *Appendix C*.

6.1 Delayed Market Value of Equity

In this section, we run a robustness test to validate the results from *Chapter 5* by using the market value of equity four months after year-end, instead of at year-end. The reason for using market value of equity four months after year-end is because firms listed on OSE have to publish their annual financial statement at least four months after year-end. Firms listed on OSE also have to publish their half-year financial statements, and until 2017 also quarterly financial statements, at least two months after the end of the time period (Oslo Børs, 2016). However, since it is not an unusual practice to make adjustments between these financial statements, we have chosen to focus on the annual financial statement (Kvifte, Oppi & Hansen, 2014). Kvifte et al. (2014) showed that there is no clear tendency on when firms publish their annual financial statement. By using the market value of equity four months after year-end,[25,26] we, therefore, secure that all firms have published their annual financial statement.

In the following, we first discuss the descriptive statistics, secondly we present the results and conclusions.

6.1.1 Descriptive Statistics

The descriptive statistics for the price regression model (6) with delayed market value of equity are virtually identical as the descriptive statistics presented in *Section 4.5.* Therefore, the descriptive statistics are not tabulated.

Note that the number of firms per year has decreased slightly compared to the number of firms in our main tests (*Table 4-3).* This is because some firms have exited OSE between 31th of December in year *t* and 30th of April in year *t+1*, resulting in a missing observation for the delayed market value of equity. Consequently, total firm-year observations is reduced to 1608.

Regarding the summary statistics for the variables used in the price regression model (6) with delayed market value of equity, all of the means and the medians (except for MVE) have increased marginally compared to *Panel A of Table 4-4*. The empirical distributions are still skewed to the right. In the correlation matrix, the only differences compared to *Table 4-5* are (1) the Pearson correlation coefficient between MVE and $BVPS'$ has decreased slightly (84%),

[25] Rather than market value of equity 3 months after year-end, which e.g., Beisland and Knivsflå (2015) used.
[26] From now on delayed market value of equity.

and (2) EPS has become slightly more correlated with MVE (69%), $BVPS$ (71%) and $BVPS'$ (62%).

6.1.2 Results and Conclusions

In this section, we test our hypotheses by using the price regression model (6) with delayed market value of equity to validate the results from our main tests. To test our hypotheses, we follow the test methodology as presented in *Chapter 3*. The results from the price regression model (6), BVPS′-model (7), EPS-model (8), and thereby the Incr. BVPS′ and Incr. EPS are virtually identical as in *Section 4.4*. Therefore, these results are neither tabulated nor discussed. Time regression models (2-5) with different VRM-variables are also not tabulated, but will be discussed in the following sections. First, we discuss the results in the light of hypotheses 1 and 3, then hypotheses 2 and 3. Based on this, we secondly decide whether the results are consistent or not with the results from our main tests.

Hypotheses 1 and 3

To test hypotheses 1 and 3, we use annual total R^2 (R_T^2) from price regression model (6) as the VRM-variable in time regression models (2-5).[27] Regressions (2-3)-AA support the findings from regressions (2-3)-A, namely increased total value relevance of accounting information in Norway over time after the transition to IFRS. Overall, compared to regressions A, the only result that is inconsistent is $TIME*FAIR$ being weakly significant and negative in regression 5-AA. Consequently, using the delayed market value of equity, the partial change in the total value relevance because of the time trend is: $\frac{\partial VRM}{\partial TIME} = 0.18 - 0.21 * INTANTEN - 1.27 * FAIR$. Note that $TIME$ and the interaction term between $TIME$ and $INTANTEN$ are insignificant, and will, therefore, not be commented. $TIME*FAIR$ being weakly significant and negative, implies that the total value relevance now decreases over time when the extent of fair value accounting increases.

Hypotheses 2 and 3

To test hypotheses 2 and 3, we use the Incr. $BVPS'(R^2_{BVPS'})$, Incr. $EPS(R^2_{EPS})$, BRC and ERC from the price regression model (6) as the VRM-variables in time regression models (2-5).[28]

---

[27] Time regression models (2-5) using delayed market value of equity are called regressions AA.

[28] Time regression models (2-5) with Incr. BVPS′ as VRM are called regressions BB. Time regression models (2-5) with Incr. EPS as VRM are called regressions CC. Time regression models (2-5) with BRC as VRM are called regressions BB-2. Time regression models (2-5) with ERC as VRM are called regressions CC-2.

Regarding book value of equity, regressions BB have similar results as our main tests (regressions B). The main difference is in regression 5-BB, where *TIME* is weakly significant and negative, implying decreased value relevance of book value of equity over time. This is supported by regression 2-BB-2. As in our main tests, we find evidence of the increased extent of fair value accounting having a positive effect, and no evidence of the increased recognition of intangible assets contributing (positive or negative) the value relevance of book value of equity over time.

Moreover, regarding earnings, regressions CC have similar findings as our main tests (regressions C). The only differences are that in regression 5-CC, *SIZE* and *MVOL* are insignificant and *FAIR* is weakly significant and positive. This strengthens the findings from our main tests of loss intensity not having a negative effect on the value relevance of earnings. If anything, we also here find a positive effect (regression 3-CC-2). *TIME* being significant and positive (regression (2-3)-CC) strengthens the findings from our main tests, namely no evidence of decreased value relevance of earnings over time. As in our main tests, we actually find evidence of increased value relevance of earnings over time. Further, the evidence of increased recognition of intangible assets having a positive effect, and no evidence of increased extent of fair value accounting having a positive (or negative) effect, on the value relevance of earnings over time, from our main tests is strengthened.

Finally, using the common explanatory power as the *VRM*-variable do not provide any significant results when using delayed market value of equity, consistent with our main tests.

Conclusions

To conclude, using delayed market value of equity provides evidence consistent with the conclusion from our main tests for hypothesis 1; increased total value relevance of accounting information in Norway over time after the transition to IFRS. Consequently, the conclusion from our main tests is strengthened. Furthermore, we find evidence of the positive time trend being supported by increased value relevance of earnings over time, which is found to be associated with increased recognition of intangible assets. Increased extent of fair value accounting is found to contribute to increased value relevance of book value of equity over time. These results are consistent with our main tests and hypothesis 3.

Note that we do find evidence of increased extent of fair value accounting having a negative net effect on total value relevance over time. Since the increased extent of fair value accounting is found to contribute to an increased value relevance of book value of equity over time, there must be a negative effect that surpasses, but that our time regression models (2-5) do not pick up, e.g., see *Section 6.2.*

Furthermore, to conclude regarding book value of equity, based on this robustness test, we cannot conclude with increased value relevance of book value of equity in Norway over time after the transition to IFRS. Note that since we in our main tests concluded with the results being inconsistent with the first part of hypothesis 2, the conclusion is strengthened. Further, as in our main tests, we find evidence of increased extent of fair value accounting contributing to an increased value relevance of book value of equity over time, consistent with hypothesis 3. Furthermore, the conclusion for the value relevance of earnings from our main tests is also strengthened, since we find evidence of increased relevance of earnings in Norway over time after the transition to IFRS. This is inconsistent with the second part of hypothesis 2. Finally, we find evidence of this increase being associated with increased recognition of intangible assets over time, consistent with our main tests and hypothesis 3.

6.2 Heteroskedasticity and Multicollinearity

Because of the possibility of having heteroscedasticity in our regression models, we correct for it by applying heteroscedasticity robust standard errors to all of them, making our t-statistics of the response coefficients robust (Gjerde et al., 2008; Wooldridge, 2012, p. 269-271).[29] In addition, we have deflated the price regression model (6) with the number of outstanding shares. This also reduces the problems with heteroskedasticity somewhat according to Christie (1987).

Moreover, multicollinearity is a well-known econometric issue with a price regression model.[30] As mentioned in *Section 3.2,* we extract EPS from $BVPS$ to avoid double counting of EPS and thereby obtaining the right loadings of both variables. If we failed to do this, there would have been built-in multicollinearity in the price regression model (6) (Penman, 1998). Further, even though other control- and explanatory variables might be significantly correlated, multicollinearity is rarely a big issue (Gjerde et al., 2008). Note that collinearity is not a violation of the assumptions for ordinary least squares regression (OLS) itself, only

[29] See also White (1980). When we correct for autocorrelation using Newey West standard error, the error term is also corrected for heteroscedasticity without using robust standard error.
[30] High (but not perfect) correlation between two or more independent variables is called multicollinearity.

perfect collinearity is. Note that when we have highly correlated variables, the loadings of the response coefficients might be somewhat over/underestimated, which can create problems when making statistical inference (Wooldridge, 2012, p. 95-99). Overall, looking at our correlation matrices in *Section 4.5.2,* multicollinearity does not seem to be a notable problem, since only *MVOL* and *MRET* of the independent variables (*CONT* and *EXP*) are correlated.

However, since the *TIME*-variable is included multiple times in time regression models (4-5), *TIME*, *TIME*INTANTEN* and *TIME*FAIR* can be highly correlated (Wooldridge, 2012, p. 243). Therefore, multicollinearity might be a problem in time regression models (4-5). Highly correlated independent variables will inflate each other's variance, resulting in higher standard errors, lower t-statistics, and thereby higher p-values (Wooldridge, 2012, p. 95-99). When tested for, the Pearson correlation coefficients show that all three variables are highly correlated. Therefore, time regression models (4-5) are likely biased towards not finding a significant effect of *TIME*INTANTEN* and *TIME*FAIR* on the value relevance measurements. Note that multicollinearity does not weaken any significant results (these might be even more significant), but there might be some significant results that have not been detected.

6.3 Autocorrelation

Autocorrelation is a potential problem in regression models with time series data. When autocorrelation is present, meaning that the error term in two different time periods are correlated, the OLS assumptions for time series data are violated (Wooldridge, 2012, p. 353). Therefore, before running the time regression models (2-5), we have tested for autocorrelation. The regression models that tested positive for autocorrelation have been corrected for first-order autocorrelation (and heteroscedasticity) by using Newey-West standard error developed by Newey and West (1987). As stated in the table texts, only regressions A were corrected for first-order autocorrelation in our main tests.

Regressions (B-C) in our main tests were conducted to test hypotheses 2 and 3. Since we failed to reject the null hypotheses of no autocorrelation in all of them, regressions (B-C) were conducted without correcting for first-order autocorrelation.[31] In this section, we re-run regressions (B-C) (naming them regressions (B-C)-A), where we correct for first-order autocorrelation (and heteroscedasticity) by using Newey-West standard errors. We find this a

[31] We corrected for problems with heteroscedasticity by using heteroscedasticity robust standard errors.

relevant robustness test as other value relevance research has corrected for autocorrelation in these regressions, e.g., Collins et al. (1997) and Gjerde et al. (2011).

Because of virtually identical results as in our main tests¸ tables of regressions (B-C)-A are not tabulated. In the following section, we first highlight the differences for the value relevance of book value of equity, secondly for the value relevance of earnings.

Regarding book value of equity, when corrected for first-order autocorrelation, *LOSSTEN* in regression 3-B-A becomes insignificant. Further, in regression 4-B-A, *INTANTEN* becomes weakly significant and positive, compared to insignificant in regression 4-B. The most important difference is in regression 5-B-A, where the time trend is weakly significant and negative. This implies decreased value relevance of book value of equity over time. To conclude, the results from this robustness test show evidence of decreasing value relevance of book value of equity in Norway over time after the transition to IFRS. This is consistent with the robustness test using delayed market value of equity (see *Section 6.1).* Note that since we in our main tests concluded with the results being inconsistent with the first part of hypothesis 2, our conclusion is strengthened.

Furthermore, this robustness test supports the conclusion of increased extent of fair value accounting contributing to increased relevance of book value of equity over time, consistent with our main tests and hypothesis 3. Since the value relevance of book value of equity is not found to be increasing over time, there must be a negative effect that surpasses the positive effect of extent of fair value accounting, but that our time regression models (2-5) do not pick up, see *Section 6.2.*

Regarding earnings, correcting for first-order autocorrelation in regressions C gives similar results as our main tests. The main differences are in regression 3-C-A, where *LOSSTEN* becomes weakly significant and positive, and in regression 5-C-A, where *MVOL* becomes insignificant. To conclude, the results from this robustness test support the conclusion from our main tests, namely no evidence of decreased value relevance of earnings over time (inconsistent with hypothesis 2). Note that we, as in our main tests, find evidence of increased value relevance of earnings over time in regression (2-3)-C-A. Further, supporting our main tests and consistent with hypothesis 3, this robustness test shows evidence of the increased value relevance of earnings over time being associated with increased recognition of intangible assets.

6.4 Winsorizing 2%

In this section, we perform a robustness test to validate the results from our main tests by winsorizing MVE, $BVPS$, $BVPS'$ and EPS over the 99 percentile and below the 1 percentile. This is instead of over the 99.5 percentile and below the 0.5 percentile as in *Section 4.3*.

The descriptive statistics with 2% winsorizing are virtually identical as the descriptive statistics with 1% winsorizing presented in *Section 4.5*, and are, therefore, not tabulated. The main differences are (1) all the means have decreased marginally and (2) the development of R_T^2 is somewhat flatter. In the correlation matrix, all the Pearson correlation coefficients have decreased marginally compared to *Table 4-5*. This is except for the correlation between MVE and EPS which has increased (72%), and the correlation between $BVPS$ and $BVPS'$which is unchanged.

The price regression model (6), BVPS′- model (7) and the EPS-model have virtually identical results with 2% winsorizing as with 1% winsorizing. Therefore, the results are not tabulated. In the following, we present the results from time regression models (2-5) using the different VRM-variables obtained from the price regression model (6) with 2% winsorizing. The results are used first to discuss hypotheses 1 and 3, secondly hypotheses 2 and 3. Finally, we present the conclusions.

6.4.1 Results and Conclusions

In this section, we test our hypotheses using VRM-variables obtained from the price regression model (6) where we have winsorized MVE, $BVPS$, $BVPS'$ and EPS at 2% to validate the results from our main tests. To test our hypotheses, we follow the test methodology as presented in *Chapter 3*. In the following, we first present the results from the time regression models (2-5). Based on these results, we secondly decide if our results are consistent or inconsistent with the results from our main tests.

Results from Time Regression Models

The results from running the time regression models (2-5) with the different VRM-variables are presented in *Table 6-1* and *Table 6-2*. In the following, we first test hypotheses 1 and 3, secondly hypotheses 2 and 3. As this is a robustness test, we seek to determine whether the increased winsorizing gives different results than our main tests.

Hypotheses 1 and 3

In this section, we seek to test hypotheses 1 and 3. We test these by using the R_T^2 from the price regression model (6) with 2% winsorizing as the *VRM*-variable in time regression models (2-5). The results are presented in *Table 6-1*.

Table 6-1: Time Regression Models with Total R^2 as VRM – Regressions AAA

	Total R^2 from price regression model (6) as VRM - winsorizing at 2%			
Variable	**2-AAA**	**3-AAA**	**4-AAA**	**5-AAA**
TIME	0.00	-0.00	-0.24	0.11
	(0.01)	(0.01)	(0.16)	(0.36)
TIME*INTANTEN			1.57	-1.40
			(2.15)	(3.26)
FAIR*TIME			0.94	-0.28
			(0.85)	(1.19)
INTANTEN			-3.21	12.22
			(6.68)	(16.94)
FAIR			-0.04	5.23
			(5.25)	(6.96)
SIZE		0.06***		0.11
		(0.01)		(0.07)
LOSSTEN		-0.48		0.53
		(0.87)		(2.07)
MRET		2.22**		0.59
		(0.78)		(1.78)
MVOL		2.62*		-2.44
		(1.22)		(4.72)
R^2	-0.09	0.33	0.39	0.70

Robust standard errors are in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The constant is not reported. Regression 2 is time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regression 3 is time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regression 4 is time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regression 5 is time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. *VRM* is the total explanatory power (R_T^2) from the price regression model (6) with 2% winsorizing. *TIME* is the time trend. *EXP* consists of *INTANTEN* and *FAIR*, where *INTANTEN* is the intensity of intangible assets and *FAIR* is the intensity of financial assets. *CONT* consists of *SIZE*, *LOSSTEN*, *MRET* and *MVOL*, where *SIZE* is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, *LOSSTEN* is the intensity of losses, *MRET* is the mean of end-month return on OSEBX above risk-free rate per year and *MVOL* is market volatility. All of the above regressions were corrected for first-order autocorrelation (and heteroscedasticity) using Newey-West standard errors, which all the p-values are based on, developed by Newey and West (1987a). Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

In regressions (2-3)-AAA, there are no significant time trends, inconsistent with our main tests (see regressions (2-3)-A). Increased winsorizing involves a larger number of extreme observations being replaced, which results in a flatter development of R_T^2. The explanatory powers are lower than in our main tests. Further, in regression 5-AAA, the increased winsorizing render both *SIZE* and *FAIR* insignificant compared to regression 5-A.

Hypotheses 2 and 3

In this section, we test hypotheses 2 and 3. We do this by using the Incr. BVPS′ ($R^2_{BVPS'}$) and Incr. EPS (R^2_{EPS}), and the BRC and the ERC from the price regression model (6) with 2% winsorizing as the VRM-variables in time regression models (2-5). The results are presented in *Table 6-2*.

Table 6-2: Time Regression Models with Incremental R^2 as VRM – Regressions BBB and CCC

	Incr. BVPS′ as VRM – winsorizing at 2%				**Incr. EPS as VRM – winsorizing at 2%**			
Variable	**2-BBB**	**3-BBB**	**4-BBB**	**5-BBB**	**2-CCC**	**3-CCC**	**4-CCC**	**5-CCC**
TIME	0.01	0.02	-0.17	-0.34	0.01	0.00	0.01	-0.10
	(0.01)	(0.01)	(0.28)	(0.38)	(0.00)	(0.01)	(0.09)	(0.05)
TIME* INTANTEN			-4.09	-2.13			0.33	3.47**
			(3.19)	(4.22)			(0.69)	(0.68)
TIME* FAIR			3.41**	3.37*			-0.23	-0.93*
			(1.20)	(1.32)			(0.62)	(0.30)
INTANTEN			26.61**	14.54			-3.19	-19.39***
			(10.74)	(21.62)			(2.59)	(3.18)
FAIR			-31.70***	-32.34**			0.93	8.20**
			(8.28)	(9.28)			(3.36)	(2.33)
SIZE		0.03		0.02		-0.00		-0.05**
		(0.05)		(0.10)		(0.01)		(0.01)
LOSSTEN		-2.04		-3.37		0.79		0.50
		(1.51)		(2.33)		(0.58)		(0.44)
MRET		-1.25		0.49		-0.23		0.36
		(3.06)		(2.74)		(0.40)		(0.41)
MVOL		5.90		4.73		-0.81		3.57**
		(3.72)		(6.29)		(0.56)		(1.02)
R^2	-0.07	0.66	0.70	0.89	0.15	0.27	0.32	0.72

Robust standard errors are in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The constant is not reported. Regressions 2 are time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regressions 3 are time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regressions 4 are time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regressions 5 are time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. *VRM* is $R^2_{BVPS'}$ for regressions BBB, and R^2_{EPS} for regressions CCC from *Table 6-2*. *TIME* is the time trend. *EXP* consists of *INTANTEN* and *FAIR*, where *INTANTEN* is the intensity of intangible assets and *FAIR* is the intensity of financial assets. *CONT* consists of *SIZE*, *LOSSTEN*, *MRET* and *MVOL*, where *SIZE* is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, *LOSSTEN* is the intensity of losses, *MRET* is the mean of end-month return on OSEBX above risk-free rate per year and *MVOL* is market volatility. None of the above regressions tested positive for autocorrelation, and, therefore, they were not corrected for first-order autocorrelation. However, we correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

Regressions BBB analyze whether the value relevance of book value of equity has increased or decreased over time, where Incr. BVPS′ is the VRM-variable. As in our main tests, there are no significant time trends in none of the regressions BBB. Looking at the differences compared to our main tests, $LOSSTEN$ in regressions 3-BBB and 5-BBB is insignificant and $INTANTEN$ in regression 4-BBB is significant positive. In addition, $FAIR*TIME$ in regression 4-BBB is significant positive. *FAIR*TIME* being significant on a 5%- and 10% significance level in the regression 4-BBB and 5-BBB respectively, strengthens the findings from our main tests.

Time regression models (2-5) with *BRC* as the *VRM*-variable (called regressions BBB-2) are not tabulated because of similar results as regressions BBB. In regression 2-BBB-2, the time trend is significant negative, as found in the robustness test using delayed market value of equity (see *Section 6.1)* and corrected for autocorrelation (see *Section 6.3).* Further, regression 5-BBB-2 supports the finding of increased extent of fair value accounting contributing to an increased value relevance of book value of equity over time from our main tests.

Moreover, regressions CCC analyze whether the value relevance of earnings has increased or decreased over time, where Incr. EPS is as the *VRM*-variable. In contrast to the regressions (2-3)-C from *Table 5-2*¸ there is no significant time trend in regressions (2-3)-CCC.

In regression 5-CCC, two changes have accrued; (1) *FAIR* is highly significant and positive (from insignificant), and (2) *FAIR*TIME* is weakly significant and negative (from insignificant). We find that increased extent of fair value accounting contributes to decreased value relevance of earnings over time. This finding is inconsistent with our main tests, but as expected in *Section 3.1* and consistent with Ohlson (1995) and Beisland and Knivsflå (2015, p. 43). Supporting our main tests, we find evidence of increased recognition of intangible assets contributing to increased value relevance of earnings over time (see regression 5-CCC). As the effects of increased extent of fair value accounting and recognition of intangible assets, on the value relevance of earnings, go in opposite directions, they seem to cancel each other out since the time trend is insignificant in regressions (2-3)-CCC.

Regressions with *ERC* (called regressions CCC-2) and common explanatory power (called regressions DDD) as the *VRM*-variables are not tabulated since they do not provide any significant results regarding the time trend, supporting the evidence from our main tests.

Conclusions

To conclude regarding total value relevance, this robustness test does not support our main tests and is inconsistent with hypothesis 1, as we cannot conclude with increased total value relevance over time.

Regarding book value of equity, we cannot conclude with increased value relevance of book value of equity over time, strengthening the conclusion from our main tests (inconsistent with the first part of hypothesis 2). Regarding hypothesis 3, this robustness test supports the conclusion from our main tests, as we find evidence of increased extent of fair value accounting contributing to increased value relevance of book value of equity over time.

Regarding earnings, from this robustness test we cannot conclude with decreased value relevance of earnings over time. Note that since we in our main tests concluded with the results being inconsistent with the second part of hypothesis 2, the conclusion is strengthened. As in our main tests, we find evidence of increased recognition of intangible assets contributing to increased value relevance of earnings over time. Notably is that increased extent of fair value accounting is now found to contribute to decreased value relevance of earnings over time, inconsistent with our main tests. Both are as expected, see *Section 3.1*, and associated with hypothesis 3. Because of the insignificant time trend, we conclude with the two effects canceling each other out, consistent with Beisland and Knivsflå (2015, p. 43).

The finding of increased extent of fair value accounting contributing to decreased value relevance of earnings over time might explain the negative contribution of increased extent of fair value accounting to total value relevance over time, found in the robustness test using delayed market value of equity (see *Section 6.1).* Therefore, we conclude with the negative contribution of increased extent of fair value accounting on the value relevance of earnings over time surpasses the positive contribution of increased extent of fair value accounting on book value of equity over time. This results in increased extent of fair value accounting having a negative contribution to the total value relevance over time. However, the time trend for both the value relevance of earnings and the total value relevance is significant positive in our main tests and the robustness test using delayed market value of equity. Consequently, we conclude with the following three findings. First, we conclude with the positive contribution of increased recognition of intangible assets surpasses the negative contribution of the increased extent of fair value accounting on the value relevance of earnings over time (resulting in the positive time trend in the value relevance of earnings). Secondly, we conclude with the negative contribution of increased extent of fair value accounting on the value relevance of earnings surpassing the positive contribution of the increased extent of fair value accounting on the value relevance of book value of equity over time (resulting in a negative contribution of the increased extent of fair value accounting on the total value relevance). Finally, we conclude with the positive contribution of increased recognition of intangible assets on the value relevance of earnings surpasses the total negative contribution of increased extent of fair value accounting over time (resulting in the positive time trend for total value relevance).

6.5 Return Regression Model

The price regression model (6) used in our main tests may suffer from several well-known econometric issues, see *Section 6.2* and *6.3*. Misspecified models may lead to wrong conclusions, and econometric issues are, therefore, an important part of value relevance research (Beisland, 2008a). Econometric issues in value relevance research have achieved a great amount of attention, and one of the most discussed ones is scaling. Therefore, we discuss scaling in the following section before presenting and running a return regression model.

6.5.1 Scaling

A scaling issue occurs when the relationship between two variables is driven by an underlying scale and is, therefore, not a causal relationship (Beisland & Knivsflå, 2008, p. 254). Theoretically, a scaling issue occurs when OLS assumptions are violated (Knivsflå, 2001, p. 12). Within value relevance research, the scaling issue occurs because smaller firms have e.g., smaller market capitalizations, smaller book value of equity and smaller earnings relative to larger firms (Gjerde et al., 2008, 2011).[32]

Existing research has shown that a cross-sectional regression of market value of equity and accounting information might only capture the scale variation, indicating that R_T^2 and R_{EPS}^2 from price regression model (6) in *Section 4.4* is overestimated (e.g., Brown et al., 1999). Brown et al. (1999) state that for R^2 to increase over time because of the scaling issue, the scaling issue must also increase over time (pp. 95-97). When plotting the coefficient of variance (CV) of firm size against time (assuming that firm size is the scaling factor consistent with Easton and Summers [2003]) in accordance with Brown et al., we see a flat line throughout the whole time period. This implies that the R_T^2 and R_{EPS}^2 do not increase in the scale factor's CV, and that the positive time trends of R_T^2 and R_{EPS}^2 found in *Figure 4-1* are, therefore, not caused by the scaling issue. Consequently, the scaling issue might only lead to overestimated R_T^2 and R_{EPS}^2, not create a trend.

One method to reduce the scaling issue in a price regression model is to deflate by the number of outstanding shares. This is done in price regression model (6), see *Section 3.2* (Christie, 1987; Beisland, 2008b; Beisland & Knivsflå, 2008; Gjerde et al., 2008, Barth & Clinch, 2009; Gjerde et al., 2011). However, other existing research has shown that the scaling issue might

[32] See also Barth and Kallapur (1996), Brown et al. (1999) and Easton and Sommers (2003).

also affect the price regression model (6) since firms with a higher market value of equity often have a higher book value of equity and earnings relative to small firms (Brown et al., 1999). Therefore, one should scale by the market value of equity (Easton & Harris, 1991; Brown et al., 1999; Easton & Sommers, 2003). Consequently, most of the scaling issue can be reduce by using a return regression model, where the variables are deflated typically by the previous time period's market value of equity.

Whether a price regression model or a return regression model is the superior model to use in value relevance research is an important and ongoing discussion. The literature is conflicting, and a number of researchers have discussed the usefulness of the two models without reaching an agreement that one outperforms the other (e.g., Landsman & Magliolo, 1988; Kothari & Zimmerman, 1995; Barth, Beaver, & Landsman, 2001; Gu, 2007). Barth et al. (2001) stated that the economic motivation of the research should govern the choice between the two major models in value relevance research (p. 95). Therefore, since we wanted to analyze the value relevance of both book value of equity and earnings, we chose the price regression model (6) as our main regression model. This is supported by Beisland and Hamberg (2008), who argued that a return regression model is primarily used as a complement to a price regression model. Based on this, we present and run a return regression model as a robustness test in the following section.

6.5.2 Test Methodology

While the price regression model (6) analyzes how accounting information can explain the level of market value of equity, a return regression model analyzes how accounting information can explain the changes in market value of equity. A return regression model can be derived from a price regression model (e.g., Easton & Harris, 1991):

$$R_{it} = \rho_0 + \rho_1 EPSDEF_{it} + \rho_2 \Delta EPSDEF_{it} + \varepsilon_{it} \tag{9}$$

Where R_{it} is the 12-month excess stock return of firm *i* measured from the end of year *t-1* to the end of year *t*. The dependent variable (R_{it}) is a function of level earnings per share deflated ($EPSDEF_{it}$) and changes in earnings per share deflated from year *t-1* to year *t* ($\Delta EPSDEF_{it}$). $EPSDEF_{it}$ and $\Delta EPSDEF_{it}$ are deflated by last year's market value of equity to further reduce the scaling issue in the price regression model (6) (Beisland & Knivsflå, 2008; Beisland & Hamberg, 2008). When there has been a stock split (reversed stock split) in year *t* we have adjusted the previous accounting numbers and market value of equity to make them comparable between year *t* and *t-1*.[33] Finally, ρ_0 is the constant term, ρ_1 and ρ_2 are the response coefficients and ε_{it} is the error term. The calculations of R, $EPSDEF$ and $\Delta EPSDEF$ are described in *Panel C of Table 4-1*.

The value relevance of earnings deflated in explaining the excess stock return can be analyzed by using (1) the total R^2 (R_R^2) from the return regression model (9), (2) the incremental explanatory power of earnings deflated (Incr. EPSDEF) and incremental explanatory power of changes in earnings deflated (Incr. ΔEPSDEF), and (3) the response coefficient for $EPSDEF$ (ρ_1) and for $\Delta EPSDEF$ (ρ_2) from the return regression model (9).

To compute the Incr. EPSDEF and Incr. ΔEPSDEF we define two new models, the EPSDEF-model (10) and the ΔEPSDEF-model (11):

$$R_{it} = \omega_0 + \omega_1 EPSDEF_{it} + \varepsilon_{it} \tag{10}$$

and

$$R_{it} = \theta_0 + \theta_1 \Delta EPSDEF_{it} + \varepsilon_{it} \tag{11}$$

By following the same test methodology as presented in *Section 3.3*, we compute Incr. EPSDEF (R_{EPSDEF}^2), Incr. ΔEPSDEF ($R_{\Delta EPSDEF}^2$) and common explanatory power (R_C^2).

In the following sections, we first present the relevant descriptive statistics. Secondly, we present the results from the return regression model (9), EPSDEF- model (10) and ΔEPSDEF-model (11). Finally, we run the time regression models (2-5) with the different VRM-variables. Note that we have winsorized R, $EPSDEF$ and $\Delta EPSDEF$ over 99.5 percentile and below 0.5 percentile as in our main tests.

6.5.3 Descriptive Statistics

In this section, we present relevant descriptive statistics for the return regression model (9).

Table 6-3 show summary statistics for the number of firms per year.

Table 6-3: Number of Firms Per Year in the Return Regression Model (9)

Year	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Firms	105	115	124	126	125	129	128	120	112	112	114	105

In 2005, the number of firms is 0 because our data sample starts in 2005, and we can, therefore, not calculate R, $EPSDEF$ or $\Delta EPSDEF$.

[33] Stock split (reversed stock split) means that a firm has divided (reduced) its existing shares into multiples (fewer) share to boost (reduce) the liquidity of its share (Investopedia, 2018a, 2018b).

Since all variables are calculated by using last year's market value of equity, the number of firms decreases compared to *Table 4-3*, as a firm with observations for year *t*, but not for year *t-1*, have been blanked. This is because we need valid observations for both year *t* and year *t-1* to calculate the variables used in the return regression model (9). Total firm-year observations has decreased to 1415. The highest number of firms is in 2011 (129) and the lowest number of firms is in 2015 and 2017 (105).

Table 6-4 presents summary statistics for variables used in the return regression model (9).

Table 6-4: Summary Statistics for Variables Used in the Return Regression Model (9)

Variable	N	Mean	St.Dev	min	p25	Median	p75	max
R	1415.00	0.10	0.83	-0.99	-0.35	-0.01	0.34	5.85
EPSDEF	1415.00	-0.12	0.74	-6.64	-0.09	0.02	0.09	0.99
ΔEPSDEF	1415.00	0.08	0.90	-3.49	-0.06	0.00	0.09	6.98

N is the number of observations per variable (all years). Mean is the sample average. St. Dev is the standard deviation. p25 is the 25 percentile, Median is the 50 percentile and p75 is the 75 percentile. Min is the lowest observation, while Max is the highest observation. R is the 12-month stock market excess return measured from the end of year *t-1* to the end of year *t*. $EPSDEF$ is earnings per share, deflated by the previous year's market value of equity (MVE). $\Delta EPSDEF_{it}=\frac{EPS_{it}-EPS_{it-1}}{MVE_{it-1}}$.

Table 6-4 shows that the mean of $EPSDEF$ and $\Delta EPSDEF$ is -0.12 and 0.08 respectively. The means are negative/low because of a big portion of losses, see *Appendix B.4*. Since the mean of $\Delta EPSDEF$ is positive, it implies that on average is $EPS_t > EPS_{t-1}$. Since the median is higher than the mean for $EPSDEF$, the empirical distribution is skewed to the left. For $\Delta EPSDEF$ and R, the median is lower than the mean, meaning that the empirical distributions are skewed to the right. The mean of R is 10%.

6.5.4 Results and Conclusions

In this section, we test the second part of hypothesis 2 and hypothesis 3, *the value relevance of earnings has decreased in Norway over time after the transition to IFRS, associated with increased recognition of intangible assets and extent of fair value accounting*. We test this by using the return regression model (9) and time regression models (2-5). The return regression model (9) cannot test hypothesis 1 or the first part of hypothesis 2, as it estimates the relationship between annual excess stock return and the level- and changes in earnings deflated.

In the following, we first present the results from the return regression model (9), EPSDEF-model (10) and ΔEPSDEF-model (11) that are used to construct the value relevance measurements. Secondly, we present the results from the time regression models (2-5). Based on these results, we thirdly decide if our results are consistent or not with the results from our main tests.

Constructing the Value Relevance Measurements

The results from running the return regression model (9), EPSDEF-model (10) and ΔEPSDEF-model (11) are presented in *Table 6-5*.

Table 6-5: Annual Regression Models

	Return regression model (9)			EPSDEF-model (10)		ΔEPSDEF-model (11)		Incr. EPSDEF	Incr. ΔEPSDEF
Year	ρ_1	ρ_2	R^2_R	ω_1	R^2_{10}	θ_1	R^2_{11}	R^2_{EPSDEF}	$R^2_{\Delta EPSDEF}$
2006	1.80***	-0.62	0.19	1.28***	0.18	0.98***	0.10	0.09	0.00
	(0.42)	(0.43)		(0.31)		(0.31)			
2007	1.47***	0.09	0.27	1.51***	0.27	0.71*	0.05	0.22	-0.01
	(0.28)	(0.20)		(0.28)		(0.37)			
2008	0.86***	-0.23***	0.24	0.68***	0.21	0.10	0.00	0.24	0.03
	(0.13)	(0.05)		(0.12)		(0.14)			
2009	0.04	-0.09	-0.00	0.02	-0.01	-0.09	0.00	-0.01	0.00
	(0.13)	(0.06)		(0.14)		(0.06)			
2010	0.30**	-0.00	0.02	0.30**	0.02	-0.02	-0.01	0.02	-0.01
	(0.15)	(0.03)		(0.14)		(0.03)			
2011	-0.01	-0.02	-0.02	-0.02	-0.01	-0.03	-0.01	-0.01	-0.01
	(0.17)	(0.11)		(0.16)		(0.10)			
2012	-0.35	0.06	0.20	-0.32*	0.21	-0.21	0.03	0.17	0.00
	(0.21)	(0.20)		(0.19)		(0.22)			
2013	-0.45	0.11	0.05	-0.39	0.05	0.02	-0.01	0.06	0.00
	(0.29)	(0.18)		(0.30)		(0.20)			
2014	-0.43***	-0.22	0.20	-0.53***	0.20	-0.64**	0.13	0.07	0.00
	(0.16)	(0.18)		(0.11)		(0.28)			
2015	0.10	-0.08	-0.01	0.03	-0.01	-0.03	-0.01	0.00	0.00
	(0.18)	(0.07)		(0.14)		(0.08)			
2016	0.17**	-0.16*	0.05	0.14**	0.02	-0.14*	0.02	0.03	0.03
	(0.08)	(0.08)		(0.06)		(0.08)			
2017	0.14*	-0.08*	0.03	0.09	0.01	-0.03	-0.00	0.04	0.02
	(0.08)	(0.05)		(0.07)		(0.06)			
Pooled	-0.09	-0.01	0.01	-0.10	0.01	-0.04	0.00	0.01	0.00
	(0.09)	(0.04)		(0.09)		(0.04)			

Robust standard errors in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. We correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. The constant is not reported. The return regression model (9) is $R_{it} = \rho_0 + \rho_1 EPSDEF_{it} + \rho_2 \Delta EPSDEF_{it} + \varepsilon_{it}$. The EPSDEF-model (10) is $R_{it} = \omega_0 + \omega_1 EPSDEF_{it}$. The ΔEPSDEF-model (11) is $R_{it} = \theta_0 + \theta_1 \Delta EPSDEF_{it}$. R^2_R, R^2_{10} and R^2_{11} are the R^2 from the return regression model (9), EPSDEF-model (10) and ΔEPSDEF-model (11) respectively. Incremental explanatory power of EPSDEF (Incr. EPSDEF) is calculated as the difference in R^2 for return regression model (9) and ΔEPSDEF-model (11), $R^2_{EPSDEF}=R^2_R - R^2_{11}$. Incremental explanatory power of ΔEPSDEF (Incr. ΔEPSDEF) is calculated as the difference in R^2 for return regression model (9) and EPSDEF-model (10), $R^2_{\Delta EPSDEF} = R^2_R$-$R^2_{10}$. Note that 2005 is missing since there are no observations from 2005.

In return regression model (9), the response coefficient for *EPSDEF* (ρ_1) is at least weakly significant in all years besides 2009, 2011, 2012, 2013 and 2015, and in the pooled regression model. The response coefficient for *EPSDEF*, when significant, is positive in all years besides

2014, implying that increased level of earnings deflated is associated with increased excess stock return, ceteris paribus. This positive relationship is expected. The response coefficient for $\Delta EPSDEF$ (ρ_2) is only highly significant in 2008 and weakly significant in 2016 and 2017. This indicates that a change in earnings deflated from year *t-1* til year *t* ($\Delta EPSDEF_{it}$) has no/little influence on excess stock return.

The explanatory power for the return regression model (9) (R_R^2) is overall low and volatile, with a top in 2007 (27%), and bottom in 2011 (-2%). Compared to the explanatory power of the price regression model (6) (R_T^2) in *Table 4-2* and *4-4*, R_R^2 is substantially lower. The mean of R_T^2 is 79%, while the mean of R_R^2 is 10%. The explanatory power decreases because we control for scale effects (see e.g., Gjerde et al. 2011). Lev (1989) claim that the explanatory power of a return regression model is "too low" to be economically relevant. Note that the (level of) R_T^2 might be overestimated because of the scaling issue as discussed in *Section 3.3* and *6.5.1*.

In the EPSDEF-model (10), the response coefficient for *EPSDEF* (ω_1) is at least weakly significant in all years besides 2009, 2011, 2013, 2015 and 2017, and in the pooled regression model. When the response coefficient is at least weakly significant, it is positive in all years besides 2012 and 2014. This is similar findings as in the return regression model (9), and the explanatory power (R_{10}^2) follows the same variation as for the return regression model (9). In the ΔEPSDEF-model (11), the response coefficient for $\Delta EPSDEF$ is weakly significant in 2007 and 2016, significant in 2014 and highly significant in 2006. The explanatory power (R_{11}^2) is never higher than for EPSDEF-model (10) (R_{10}^2).

The marginal increase in R^2 due to the inclusion of *EPSDEF* (Incr. EPSDEF [R_{EPSDEF}^2]) is higher than the marginal increase in R^2 due to the inclusion of $\Delta EPSDEF$ (Incr. ΔEPSDEF [$R_{\Delta EPSDEF}^2$]) in all years besides 2009. The Incr. EPSDEF is at its highest in 2008 (24%) and its lowest in 2009 and 2011 (-0.1%). The mean of R_{EPSDEF}^2 is 8%. The Incr. ΔEPSDEF is 0% or lower in 8 out of 12 years and in the pooled regression. The highest Incr. ΔEPSDEF is in 2008 and 2016 (3%). The common R^2, the explanatory power without the marginal contribution of *EPSDEF* and $\Delta EPSDEF$, is on average 2%.

Results from Time Regression Models

The results from running the time regression models (2-5) are presented in *Table 6-6* and *6-7*. The results are used to test the second part of hypothesis 2 and hypothesis 3.[34] Note that the price regression model (6) only tests the value relevance of level earnings, while the return regression model (9) tests the value relevance of level earnings, changes in earnings, and the two combined (total earnings). As this is a robustness test, we seek to determine whether the results from the return regression model (9) are consistent with the results from our main tests.

Value Relevance of Total Earnings

To validate the results from our main tests, we first use the total adjusted R^2 (R_R^2) from the return regression model (9) as the VRM-variable in time regression models (2-5). This is to analyze the development in value relevance of total earnings deflated in explaining the excess stock return. The results are presented in *Table 6-6.*

Table 6-6: Time Regression Models with Total R² from Return Regression Model (9) as VRM – Regressions E

	Total R² from return regression model (9) as VRM			
Variable	**2-E**	**3-E**	**4-E**	**5-E**
TIME	-0.01**	-0.02**	0.02	0.46
	(0.01)	(0.01)	(0.21)	(0.37)
TIME*INTANTEN			-1.29	-5.40
			(1.89)	(3.86)
TIME*FAIR			0.45	-0.82
			(0.91)	(1.41)
INTANTEN			3.65	25.41
			(6.15)	(15.50)
FAIR			-9.00	-2.39
			(5.82)	(9.87)
SIZE		0.17		-0.05
		(0.31)		(0.60)
LOSSTEN		1.22		1.80
		(0.78)		(1.43)
MRET		-2.54		-4.06
		(2.05)		(3.23)
MVOL		-3.34**		-8.24*
		(1.22)		(3.89)
R^2	0.14	0.51	0.43	0.85

Robust standard errors are in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The constant is not reported. Regression 2 is time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regression 3 is time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regression 4 is time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regression 5 is time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. VRM is the total explanatory power (R_T^2) from the return regression model (9). $TIME$ is the time trend. EXP consists of $INTANTEN$ and $FAIR$, where $INTANTEN$ is the intensity of intangible assets and $FAIR$ is the intensity of financial assets. $CONT$ consists of $SIZE$, $LOSSTEN$, $MRET$ and $MVOL$, where $SIZE$ is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, $LOSSTEN$ is the intensity of losses, $MRET$ is the mean of end-month return on OSEBX above risk-free rate per year and $MVOL$ is market volatility. None of the above regressions tested positive for

[34] The results are robust to running the return regression model (9) with stock return instead of excess stock return.

autocorrelation, and therefore, they were not corrected for first-order autocorrelation. However, we correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

In regressions (2-3)-E, the response coefficient for $TIME$ is significant and negative, indicating that the value relevance of total earnings deflated decreases over time. This finding is inconsistent with the results from our main tests, where we found no evidence of decreased value relevance of (level) earnings over time. Regression 3-E includes the control variables ($CONT$), where $MVOL$ is the only significant control variable. The response coefficient for $MVOL$ is negative. This is inconsistent with the findings from our main tests, but as expected in *Section 3.1*.

In regression 4-E, all response coefficients ($TIME$ and EXP) are insignificant. Compared to regressions 4-C and 4-C-2 in our main tests, the results are consistent. Further, in regression 5-E, all variables ($TIME$, $CONT$ and EXP) are insignificant, except for $MVOL$ being weakly significant and negative. $LOSSTEN$ being insignificant supports the result from our main tests, while $SIZE$ being insignificant weakens our result from the main tests. In addition, $TIME*FAIR$ being insignificant is consistent with our main tests: no evidence of increased extent of fair value accounting effecting (positive or negative) the value relevance of (level) earnings over time. Finally, as $TIME*INTANTEN$ is insignificant, this robustness test does not support the finding from our main tests of increased recognition of intangible contributing to increased value relevance of (level) earnings over time.

Value Relevance of Level Earnings and Changes in Earnings

To further validate the results from our main tests, we also test the value relevance of level- and changes in earnings. We test this by using the Incr. EPSDEF and Incr. ΔEPSDEF from *Table 6-5*, and the $EPSDEF$ coefficient (ρ_1) and $\Delta EPSDEF$ coefficient (ρ_2) from the return regression model (9) as the VRM-variables in the time regression models (2-5). The results are presented in *Table 6-7*. Only the time regression models with significant results regarding the time trend are tabulated. Regressions (2-5)-DR, with common explanatory power as the VRM-variable, are not tabulated as there are no significant results regarding the time trend, supporting the results from our main tests.

Table 6-7: Time Regression Models with Incremental R^2 and Response Coefficient from Return Regression Model (9) as VRM – Regressions F, G, H and I

	Incr. EPSDEF as VRM		Incr. ΔEPSDEF as VRM	EPSDEF coefficient (ρ_1) as VRM		ΔEPSDEF coefficient (ρ_2) as VRM
Variable	**2-F**	**3-F**	**4-G**	**2-H**	**3-H**	**3-I**
TIME	-0.01*	-0.02**	0.02	-0.14**	-0.18**	-0.05***
	(0.01)	(0.01)	(0.03)	(0.05)	(0.07)	(0.01)
TIME*INTANTEN			-0.43*			
			(0.18)			
TIME* FAIR			0.07			
			(0.18)			
INTANTEN			1.86**			
			(0.60)			
FAIR			-1.46			
			(0.96)			
SIZE		0.38			0.79	2.16**
		(0.23)			(2.44)	(0.61)
LOSSTEN		0.89			9.38	-2.11
		(0.83)			(5.75)	(1.73)
MRET		-1.13			-6.52	7.71**
		(1.42)			(10.51)	(2.88)
MVOL		-1.52			-14.45	2.63
		(0.86)			(8.11)	(2.18)
R^2	0.15	0.58	0.60	0.45	0.37	0.41

Robust standard errors are in parentheses. The stars represent the p-value, where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The constant is not reported. Regressions 2 are time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regressions 3 are time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regressions 4 are time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regressions 5 are time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. *VRM* is Incr. EPSDEF for regressions F, Incr. ΔEPSDEF for regressions G, the response coefficient for *EPSDEF* (ρ_1) for regressions H and the response coefficient for *ΔEPSDEF* (ρ_2) for regressions I from *Table 6-5*. All the dependent variables are from the return regression model (9). *TIME* is the time trend. *EXP* consists of *INTANTEN* and *FAIR*, where *INTANTEN* is the intensity of intangible assets and *FAIR* is the intensity of financial assets. *CONT* consists of *SIZE*, *LOSSTEN*, *MRET* and *MVOL*, where *SIZE* is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, *LOSSTEN* is the intensity of losses, *MRET* is the mean of end-month return on OSEBX above risk-free rate per year and *MVOL* is market volatility. None of the above regressions tested positive for autocorrelation, and therefore, they were not corrected for first-order autocorrelation. However, we correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

Regressions F and H analyze whether the value relevance of level earnings deflated in explaining the excess stock return has increased or decreased over time. To test this we use Incr. EPSDEF (R^2_{EPSDEF}) and the *EPSDEF* coefficient (ρ_1) from *Table 6-5* as the *VRM*-variables. In regressions (2-3)-F and (2-3)-H, *TIME* is significant negative, indicating decreased value relevance of level earnings deflated over time. This is inconsistent with our main tests and the robustness tests using delayed market value of equity (see *Section 6.1*), corrected for autocorrelation (see *Section 6.3)* and winsorizing at 2% (see *Section 6.4).*

Further, this robustness test shows no evidence of increased recognition of intangible assets having a positive contribution to the value relevance of level earnings deflated, inconsistent with our main tests and expectation (see *Section 3.1)*. In addition, there is no evidence of increased extent of fair value accounting contributing (positive or negative) to the value relevance of level earnings deflated, consistent with our main tests.

Moreover, regressions G and I analyze whether the value relevance of changes in earnings deflated in explaining excess stock return has increased or decreased over time. To test this, we use Incr. ΔEPSDEF ($R^2_{\Delta EPSDEF}$) and the $\Delta EPSDEF$ coefficient (ρ_2) from *Table 6-5* as the VRM-variables. Regressions G find no evidence of decreasing (or increasing) value relevance of changes in earnings deflated over time. However, regression 3-I find a significant negative time trend of the value relevance of changes in earnings deflated. This finding is consistent with the evidence for level earnings in the regressions F and H. Although, it is inconsistent with the results from our main tests on (level) earnings.

Furthermore, this robustness test shows evidence of increased recognition of intangible assets having a negative contribution to the value relevance of changes in earnings deflated over time. This is not as expected in *Section 3.1*. The result is also inconsistent with the results for level earnings in our main tests and the robustness tests using delayed market value of equity (see *Section 6.1*), corrected for autocorrelation (see *Section 6.3)* and winsorizing at 2% (see *Section 6.4).* Finally, we find no evidence of increased extent of fair value accounting contributing (positive or negative) to the value relevance of changes in earnings over time, consistent with our main tests for (level) earnings.

Conclusion

To conclude, return regression model (9) provides evidence of decreasing value relevance of total (level and changes in combined) earnings deflated over time. The negative time trend is supported by decreasing value relevance of both level- and changes in earnings deflated over time. This result is inconsistent with our main tests but consistent with the second part of hypothesis 2.

Decreased value relevance of changes in earnings deflated over time is associated with increased recognition of intangible assets. This is inconsistent with our expectation in *Section 3.1,* and the findings of Aboody and Lev (1998) and Gjerde et al. (2008). Note that this is the contribution of increased recognition of intangible assets to the value relevance of changes in earnings, not to the value relevance of level earnings as in our main tests.

Finally, we conclude with the negative time trend for level earnings deflated over time being associated with the negative contribution of increased extent of fair value accounting to level earnings, from the robustness test winsorizing at 2% in *Section 6.4*. We, therefore, conclude with increased extent of fair value accounting contributing to decreased value relevance of level earnings, inconsistent with our main tests. However, this is consistent with Ohlson (1995) and Beisland and Knivsflå (2015, p. 43) and hypothesis 3. Note that this negative effect may be present in our main tests, but not found because of extreme values, scaling issue and/or multicollinearity.

Overall, the return regression model (9) implies that the evidence of increased value relevance of earnings over time from our main tests may be driven by scale effects – and that the value relevance of earnings may actually be decreasing. This is consistent with Brown et al. (1999), who showed that it is the scale effects, present in level regression models, which increase the explanatory power (the VRM-variable) and lead to a misleading relationship between two variables. Brown et al. showed that the findings of Collins et al. (1997) and Francis and Schipper (1999), who used a price regression model, was largely attributable to scale effects. Note that we have tested the CV for firm size (the assumed scaling effect consistent with Easton and Summers [2003]), and found that the scaling issue might only lead to overestimated R^2_{EPS} and not create the positive time trend found in our main tests. However, we cannot rule out that there are scale effects caused by other scaling factors, e.g., book value of equity and earnings, which create the positive time trend for the value relevance of earnings in our main tests.

6.6 Abnormal Return Regression Model

Even though the return regression model (9) further reduces the scaling issue by using variables deflated by last year's market value of equity, (excess) stock returns still include a scale component determined by the expected rate of return (Gjerde et al., 2011). Therefore, the scaling issue can be further reduced by using abnormal stock return, instead of excess stock return, as the dependent variable, and abnormal earnings as the independent variable (e.g., Freeman & Tse, 1992). Abnormal return is computed by subtracting the expected rate of return from the stock return, where expected rate of return equals the cost of equity (Gjerde et al., 2011).[35] Abnormal earnings are the difference between total earnings and expected earnings, where analyst forecasts can be used as a proxy for expected earnings (Beisland, 2008a). In accordance with Beisland (2008a), we have chosen abnormal earnings to be the changes in earnings deflated, $\Delta EPSDEF$ (p. 12).[36] An abnormal return regression model can be derived from a return regression model (e.g., Easton & Harris, 1991; Beisland, 2012):

$$AR_{it} = \rho_0 + \rho_2 \Delta EPSDEF_{it} + \varepsilon_{it} \quad (12)$$

Where AR_{it} is the abnormal stock return of firm *i* in year *t*, and equals stock return less expected rate of return (cost of equity). Expected rate of return is calculated by using CAPM. The dependent variable (AR_{it}) is a function of changes in earnings per share deflated from year *t-1* til year *t* ($\Delta EPSDEF_{it}$). Further, ρ_0 is the constant term, ρ_2 is the response coefficient and ε_{it} is the error term,. The calculation of AR is described in *Panel D of Table 4-1*.

Note that ρ_2 from abnormal return regression model (12) often is referred to as the "earnings response coefficient",[37] and measures the magnitude of new information captured in (abnormal) stock returns (Kothari, 2001, p. 123; Beisland, 2008a). The value relevance of changes in earnings in explaining the abnormal stock return can be analyzed by using the total adjusted explanatory power and the earnings response coefficient.

In the following sections, we first present the relevant descriptive statistics. Secondly, we present the results from the abnormal return regression model (12). Finally, we run the time regression models (2-5) with the *VRM*-variables obtained from the abnormal return regression model (12). Note that we have winsorized AR and $\Delta EPSDEF$ over 99.5 percentile and below 0.5 percentile as in our main tests.[38]

---

[35] Abnormal return can also be computed by e.g. the Fama French three-factor model (Beisland, 2009; Fama & French, 1992).
[36] Changes in earnings is a proxy for the surprise element in reported earnings, and according to Beisland (2008) this is abnormal earnings in its simplest form (p. 12; Lev & Zarowin, 1999).
[37] In addition to ρ_1 in the return regression model (Beisland, 2008a).
[38] The results are robust to winsorizing the variables used in the abnormal return regression model (12) at 2%.

6.6.1 Descriptive Statistics

In this section, we present the relevant descriptive statistics for the abnormal return regression model (12).

The number of firms per year is the same as in the return regression model (9), see *Table 6-3*. Total firm-year observations is, therefore, still 1415. *Table 6-8* presents summary statistics for the variables used in the abnormal return regression model (12).

Table 6-8: Summary Statistics for Variables Used in the Abnormal Return Regression Model (12)

Variable	N	Mean	St.Dev	Min	p25	Median	p75	max
AR	1415.00	0.03	0.83	-1.07	-0.42	-0.08	0.27	5.74
ΔEPSDEF	1415.00	0.08	0.90	-3.49	-0.06	0.00	0.09	6.98

N is the number of observations per variable (all years). Mean is the sample average. St. Dev is the standard deviation. p25 is the 25 percentile, Median is the 50 percentile and p75 is the 75 percentile. Min is the lowest observation, while Max is the highest observation. $\Delta EPSDEF_{it}=\frac{EPS_{it}-EPS_{it-1}}{MVE_{it-1}}$. AR is the 12-month abnormal return measured from the end of year *t-1* to the end of year *t*

The mean abnormal stock return is 3%. The lowest observation is -107% and the highest observation is 574%. The mean $\Delta EPSDEF$ is 0.08 and the median is 0.00. The lowest observation for $\Delta EPSDEF$ is -3.49 and the highest observation is 6.98. Since the median is lower than the mean for both variables, the empirical distributions are skewed to the right.

6.6.2 Results and Conclusions

In this section, we test the second part of hypothesis 2 and hypothesis 3. We test this by using the total annual explanatory power (R_A^2) and the earnings response coefficient (ρ_2) obtained from abnormal return regression model (12) as the *VRM*-variables in the time regression models (2-5). As the return regression model (9), the abnormal return regression model (12) cannot be used to test hypothesis 1 or the first part of hypothesis 2. This is because the abnormal return regression model (12) estimates the relationship between annual abnormal stock return and changes in earnings deflated.

In the following, we first present the results from the annual abnormal return regression model (12). Secondly, we present the results from the time regression models (2-5) where each annual value relevance measurement is used as the dependent variable. Based on the results, we finally decide if this robustness test validates the results from our main tests.

Results from Abnormal Return Regression Model

The results from running the annual abnormal return regression model (12) are shown in *Table 6-9*.

Table 6-9: Annual Abnormal Return Regression Model (12)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
ρ_2	0.98 ***	0.71 *	0.10	-0.09	-0.02	-0.03	-0.21	-0.63 **	-0.02	-0.02	-0.14 *	-0.03
	(0.31)	(0.38)	(0.15)	(0.06)	(0.03)	(0.10)	(0.22)	(0.20)	(0.27)	(0.08)	(0.08)	(0.06)
R_A^2	0.10	0.05	0.00	0.00	-0.01	-0.01	0.04	-0.01	0.13	-0.01	0.02	-0.01

Robust standard errors in parentheses. The stars represent the p-value, where * p < 0.10, ** p < 0.05, *** p < 0.01. We correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. The constant is not reported. The abnormal return regression model (12) is $AR_{it} = \rho_0 + \rho_2 \Delta EPSDEF_{it} + \varepsilon_{it}$. R_A^2 is the R^2 from the abnormal return regression model (12). Note that 2005 is missing since there are no observations from 2005.

The response coefficient for $\Delta EPSDEF$ (ρ_2) is at least weakly significant and positive in 2006 and 2007, while it in 2014 and 2016 is at least weakly significant and negative. However, as the response coefficient for $\Delta EPSDEF$ is insignificant in 8 of 12 years, the changes in earnings deflated is found to have little influence on the abnormal stock return. The pooled regression model is not tabulated as the response coefficient is insignificant and the explanatory power is 0%.

The mean explanatory power (R_A^2) is 2%. The highest R_A^2 is 13% (2014), and the lowest R_A^2 is -1% (2010, 2011, 2013 and 2015). Since the median is lower than the mean, the empirical distribution for R_A^2 is skewed to the right. As the abnormal return regression (12) further reduces the scaling issue, it is as expected that R_A^2 decreases further compared R_R^2 (and R_T^2).

Results from Time Regression Models

The results from running the time regression models (2-5) with total R^2 (R_A^2) and the response coefficient for $\Delta EPSDEF$ (ρ_2) as the *VRM*-variables are presented in *Table 6-10*. The results are used to test the second part of hypothesis 2 and hypothesis 3. Based on the results, we decide if our results are consistent or not with the results from our main tests.

Table 6-10: Time Regression Models with Total R^2 and the ΔEPSDEF Coefficient from Abnormal Return Regression Model (12) as VRM – Regressions J and K

	Total R^2 from abnormal return regression (12) as VRM				**ΔEPSDEF coefficient from abnormal return regression (12) VRM**			
Variable	**2-J**	**3-J**	**4-J**	**5-J**	**2-K**	**3-K**	**4-K**	**5-K**
TIME	-0.00	-0.00	-0.03	0.47	-0.08**	-0.01**	-0.84*	-2.94
	(0.00)	(0.00)	(0.07)	(0.28)	(0.03)	(0.04)	(0.38)	(1.86)
TIME*INTANTEN			0.41	-4.82			3.36	27.27
			(0.70)	(2.52)			(3.20)	(19.93)
TIME*FAIR			0.03	-0.88			4.11*	7.06

			(0.33)	(0.78)			(2.05)	(4.92)
INTANTEN			-2.89	20.15			-28.67**	-137.31
			(2.34)	(10.66)			(10.74)	(88.65)
FAIR			-1.30	1.94			-31.19**	-37.06
			(2.01)	(4.34)			(11.41)	(29.92)
SIZE		-0.20		-0.76		-0.20		2.84
		(0.13)		(0.36)		(1.43)		(2.31)
LOSSTEN		0.34		0.73		3.04		-2.61
		(0.24)		(0.91)		(3.60)		(4.61)
MRET		-1.37		-4.39		-4.24		17.79
		(0.92)		(2.22)		(6.98)		(14.18)
MVOL		-1.80*		-5.89		-10.07		27.73
		(0.74)		(2.71)		(5.60)		(21.16)
R^2	-0.05	0.43	0.32	0.85	0.40	0.30	0.67	0.89

Robust standard errors are in parentheses. The stars represent the p-value, where * p < 0.10, ** p < 0.05, *** p < 0.01. The constant is not reported. Regressions 2 are time regression model (2); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \varepsilon_t$, and the corresponding R^2 is the adjusted R^2. Regressions 3 are time regression model (3); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_4 CONT_t + \varepsilon_t$. Regressions 4 are time regression model (4); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \varepsilon_t$. Regressions 5 are time regression model (5); $VRM_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 TIME_t * EXP_t + \alpha_3 EXP_t + \alpha_4\ CONT_t + \varepsilon_t$. VRM is R_A^2 for regressions J and ρ_2 for regressions K from *Table 4-2*. $TIME$ is the time trend*.* EXP consists of $INTANTEN$ and $FAIR$, where $INTANTEN$ is the intensity of intangible assets and $FAIR$ is the intensity of financial assets. $CONT$ consists of $SIZE$, $LOSSTEN$, $MRET$ and $MVOL$, where $SIZE$ is a proxy risk factor measured by the logarithm of the previous year's mean market value of equity, $LOSSTEN$ is the intensity of losses, $MRET$ is the mean of end-month return on OSEBX above risk-free rate per year and $MVOL$ is market volatility. Regressions J are corrected for first-order autocorrelation (and heteroscedasticity) using Newley-west standard error, while regression K tested negative for autocorrelation, and, therefore, they were not corrected for first-order autocorrelation. However, we correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors in the regressions K. Since R^2 can be superficial high due to the inclusion of the time trend, we have detrended the time series to get the true variation explained by the explanatory variables. Therefore, the R^2 reported in the table for time regression models (3-5) is the R^2 from the detrended series (unadjusted).

Table 6-10 shows no significant time trend in none of the regressions J, implying that there has not been a change in the value relevance of changes in earnings deflated over time. This is consistent with the evidence from return regression model (9), where the time trend of the Incr. $\Delta EPSDEF$ was insignificant (see regression 4-G in *Table 6-7).*[39]

From regressions (4-5)-J, there is no evidence of neither increased recognition of intangible assets nor increased extent of fair value accounting contributing (positive or negative) to the value relevance of changes in earnings deflated over time. This supports the findings from return regression model (9) on the extent of fair value accounting, but not for the recognition of intangible assets. The results regarding recognition of intangible assets are also inconsistent with the result from our main tests.

Regressions K show that the time trend of the response coefficient for $\Delta EPSDEF$ is significant and negative, implying that there has been a decrease in the value relevance of changes in

[39] All of the time regression models (2-5) with Incr. $\Delta EPSDEF$ as VRM-variable has insignificant time trend. However, only model (3) is tabulated, see *Table 6-7*.

earnings deflated over time. This is inconsistent with the results for (level) earnings in our main tests, but it supports the results from return regression models (9) (see regressions (2-3)-E-F, (2-3)-H, 3-I). In addition, in regression 4-K *TIME*FAIR* is weakly significant and positive. This implies that increased extent of fair value accounting contributes to an increased value relevance of changes in earnings deflated over time. This is inconsistent with the evidence of level earnings from our main tests and our expectation in *Section 3.1*.

Conclusions

To conclude, this robustness test shows evidence of decreasing value relevance of changes in earnings deflated over time, consistent with the second part of hypothesis 2. Note that since we in our main tests concluded with the results being inconsistent with the second part of hypothesis 2 for level earnings, our conclusion is weakened.

The negative time trend is associated with increased recognition of intangible assets from the return regression model (9). Further, we find evidence of increased extent of fair value accounting contributing to an increased value relevance of changes in earnings deflated over time, associated with hypothesis 3. This is inconsistent with the results from our main tests and the results from the robustness tests using delayed market value of equity, correcting for problems with autocorrelation and 2% winsorizing on the value relevance of level earnings. Therefore, we conclude with increased extent of fair value accounting having the opposite contribution to the value relevance of level- and changes in earnings. Finally, as the time trend of the value relevance of changes in earnings is negative, we conclude with the negative contribution of increased recognition of intangible assets surpasses the positive contribution of increased extent of fair value accounting on the value relevance of changes in earnings deflated over time. Note that for both the value relevance of level- and changes in earnings, the contribution of increased recognition of intangible assets surpasses the contribution of increased extent of fair value accounting.

6.7 Conclusions from Robustness Tests

In this section, we discuss whether the robustness tests validate the results from our main tests.

First, we discuss hypothesis 1, *the total value relevance of accounting information in Norway has increased over time after the transition to IFRS*. The results from the robustness test using delayed market value of equity supports the conclusion from our main tests and is consistent with hypothesis 1. The robustness test with 2% winsorizing finds no evidence of increased (or decreased) total value relevance over time. Overall, we, therefore, conclude with the results from our main tests being robust and consistent with hypothesis 1.

Secondly, we discuss the first part of hypothesis 2, *the value relevance of book value of equity has increased in Norway over time after the transition to IFRS*. The robustness tests using delayed market value of equity, correcting for problems with autocorrelation and 2% winsorizing support the conclusion from our main tests. They all find no evidence of increased value relevance of book value of equity over time, inconsistent with the first part of hypothesis 2. Further supporting our main tests, these robustness tests find evidence of increased extent of fair value accounting contributing to increased value relevance of book value of equity over time. Note that as we find some evidence of decreased value relevance of book value of equity over time, there must be a negative effect that surpasses the positive contribution of increased extent of fair value accounting that our time regression models (2-5) do not pick up.

Thirdly, we discuss the second part of hypotheses 2, *the value relevance of earnings has decreased in Norway over time after the transition to IFRS*. The robustness tests using delayed market value of equity, correcting for problems with autocorrelation and 2% winsorizing support the conclusion from our main tests, inconsistent with hypothesis 2. They all find no evidence of decreased value relevance of level earnings over time. The robustness tests show an increasing value relevance of level earnings, which is found to be associated with increased recognition of intangible assets. Note that even though there is evidence of extent of fair value accounting contributing to a decreasing value relevance of level earnings, the conclusion is still that that the value relevance of earnings has not decreased. This implies that the negative contribution of increased extent of fair value accounting does not surpass the positive contribution of increased recognition of intangible assets.

Furthermore, the return regression model (9) and abnormal return regression model (12) find evidence of decreasing value relevance of total-, level- and changes in earnings deflated. This is inconsistent with our main tests for level earnings, but consistent with hypothesis 2. The return regression model (9) and abnormal return regression (12) are, therefore, implying that scale effects may drive the increased value relevance of earnings from the price regression model (6), as discussed in *Section 6.5.4*. Brown et al. (1999, p. 108) recommend that researchers should evaluate regression models using per share or level variables with cautiousness because of the scaling issue. In addition, Brown et al. recommend researchers to control for scale effects by e.g., deflating by a proxy of scale. These recommendations speak in favor of the return regression model (9) and abnormal return regression model (12). The decreasing value relevance of earnings deflated over time from return regression model (9) and abnormal return regression model (12) is found to be associated with increased recognition of intangible assets. This is supported by the negative contribution from recognition of intangible assets surpassing the positive contribution of extent of fair value accounting on the value relevance of earnings deflated over time.

However, existing research has found that increased recognition of intangible assets (extent of fair value accounting) has contributed to increased (decreased) value relevance of earnings over time (Ohlson, 1995; Dichev and Tang, 2008; Beisland and Knivsflå, 2015). This is also consistent with the findings from our main tests. In addition, Lev (1989) argued that the explanatory power in a return regression model is "too low" to be economically relevant. Based on this, we conclude with the result from our main tests being robust: increased value relevance of earnings in over time (inconsistent with hypothesis 2), which is found to be associated with increased recognition of intangible assets.

Finally, we discuss hypothesis 3, *hypotheses 1 and 2 are associated with increased recognition of intangible assets and extent of fair value accounting.* The robustness tests using delayed market value of equity, correcting for problems with autocorrelation and 2% winsorizing support the conclusion from our main tests (consistent with hypothesis 3). They all find evidence of increased recognition of intangible assets (extent of fair value accounting) contributing to increased value relevance of earnings (book value of equity) over time, associated with increased total value relevance.

7. Conclusion

In this master thesis, we analyze the changes in value relevance of accounting information for firms listed on OSE over time after the transition to IFRS in 2005. We consider this to be an important research topic because the objective of IFRS is to provide existing and potential equity investors, lenders and other creditors with useful financial information (IASB, 2010).

To analyze the changes in value relevance, we use a price regression model and time regression models, which are central value relevance regression models. By running the price regression model, we obtain value relevance measurements entering in the time regression models. The results from the time regression models, where we control for firm-specific and economic factors are then used to analyze the changes in value relevance over time. We perform several robustness tests to validate the results from our main tests. An overview of the central results is presented in *Appendix D.*

From our main tests, we conclude with increased total value relevance of accounting information in Norway over time after the transition to IFRS. This conclusion is consistent with the findings of Collins et al. (1997) and Gjerde et al. (2011), who found increased value relevance over time. The positive time trend is supported by increased value relevance of earnings over time, which is found to be associated with increased recognition of intangible assets. Increased extent of fair value accounting is found to contribute to the increased value relevance of book value of equity over time.

The robustness tests support the conclusion from our main tests of increased total value relevance over time and increased extent of fair value accounting contributing to increased value relevance of book value of equity over time. However, the robustness tests using the return regression model and abnormal return regression model do reveal that the increased value relevance of earnings over time may be driven by scale effects – and may actually be decreasing. Nevertheless, we believe that that the price regression model (6) is the superior regression model to test our research question.

Overall, we conclude with increased total value relevance of accounting information in Norway over time after the transition to IFRS, associated with increased recognition of intangible assets and extent of fair value accounting. We control for firm-specific characteristics and economic factors which may affect the value relevance of accounting information. Consequently, we conclude with the impact of IFRS over time, as the original standards have changed, on the total value relevance of accounting information in Norway has been positive. Therefore, we claim that IFRS reaches its objective of providing existing and potential equity investors, lenders and other creditors with useful financial information.

This master thesis contributes to existing value relevance literature as we are the first to analyze the changes in the value relevance of accounting information in Norway over time after the transition to IFRS. Since value relevance of IFRS is such an important research topic, and there is a new wave of changes to IFRS effective from 2018/2019 (e.g., IFRS 9 *Financial Instruments*, IFRS 15 *Revenues from Contracts with customers* and IFRS 16 *Leases*), it would be interesting to reproduce this analysis in the future to further analyze the impact of IFRS over time on the value relevance of accounting information in Norway.

References

Aboody, D. & Lev, B. (1998). The value relevance of intangibles: The case of software capitalization. *Journal of Accounting research, 36,* 161-191.

Aboody, D., Hughes, J., & Liu, J. (2002). Measuring value relevance in a (possibly) inefficient market. *Journal of accounting research, 40(4),* 965-986.

ACCA (2011). IAS 19 - the changes and effects. Obtained 01.09.2018 from https://www.accaglobal.com/in/en/member/discover/cpd-articles/corporate-reporting/ias-19.html.

Accountancy Daily (2005). IFRS 7 - Dealing with disclosures. Obtained 01.11.2018 from https://www.accountancydaily.co/ifrs%C2%A07-dealing-disclosures.

Ball, R. & Brown, P. (1968). An empirical evaluation of accounting income numbers. *Journal of accounting research, Vol.6(2),* 159-178.

Barth, M. (1994). Fair value accounting: Evidence from investment securities and the market valuation of banks. *Accounting review,* 1-25.

Barth, M. & Kallapur, S. (1996). The effects of cross-sectional scale differences on regression results in empirical accounting research. *Contemporary Accounting Research, 13(2*), 527-567.

Barth, M., Beaver, W., & Landsman, W. (1996). Value-relevance of banks' fair value disclosures under SFAS No. 107. *Accounting review,* 513-537.

Barth, M. Beaver, W. & Landsman, W. (1998). Relative valuation roles of equity book value and net income as a function of financial health. *Journal of Accounting and Economics*, *25(1),* 1-34.

Barth, M., Beaver, W., & Landsman, W. (2001). The relevance of the value relevance literature for financial accounting standard setting: another view. *Journal of accounting and economics, 31(1-3),* 77-104.

Barth, M., Landsman, W., & Lang, M. (2008). International accounting standards and accounting quality. *Journal of accounting research, 46(3),* 467-498.

Barth, M. & Clinch, G. (2009). Scale effects in capital markets-based accounting research. *Journal of Business Finance & Accounting*, *36(3-4),* 253-288.

Barth, M., Li, K., & McClure, C. (2018). Evolution in value relevance of accounting information. *Working paper.*

Basu, S. (1997). The conservatism principle and the asymmetric timeliness of earnings. *Journal of accounting and economics*, *24(1),* 3-37.

BDO (2013). IFRS at a glance. Obtained from https://www.bdo.global/getmedia/08a9ee73-bffd-4d3d-933f-0a9780fb1aac/IFRS-11.pdf.aspx.

Beaver, W. (1968). The information content of annual earnings announcements. *Journal of accounting research*, *Vol.6,* 67-92.

Beisland, L. (2008a). An introduction to the Value Relevance Literature. *Essays on the value relevance of Accounting information*, 1-76.

Beisland, L. (2008b). Predictive Ability and Value Relevance of Accounting Measures. *Essays on the value relevance of Accounting information*, 77-134.

Beisland, L. & Hamberg, M. (2008). Variations in the Value Relevance of Accounting Information. *Essays on the value relevance of Accounting information*, 135-178.

Beisland, L. & Knivsflå, K. (2008). Has IFRS Changed How Investors Respond to Earnings and Book Values? *Essays on the Value Relevance of Accounting Information,* 237-287.

Beisland, L. (2009). A Review of the Value Relevance Literature. *The Open Business Journal, 2(1),* 7-27.

Beisland, L. (2012). Verdirelevansen til norsk regnskapsinformasjon. *Magma, 2/2012,* 34-41.

Beisland, L. (2013). The value relevance of accounting information during the global financial crisis: evidence from Norway. *International Journal of Economics and Accounting, 4(3),* 249-263.

Beisland, L. & Knivsflå, K. (2015). Have IFRS changed how stock prices are associated with earnings and book values? Evidence from Norway. *Review of Accounting and Finance, 14(1),* 41-63.

Bekaert, G. & Wu, G. (2000). Asymmetric volatility and risk in equity markets. *The review of financial studies, 13(1),* 1-42.

Bernhoft, A. & Hansen, P. (2014). Et regnskapsregelverk i endring - hva, hvordan, når og hvorfor? *Magma, 1/2014,* 33-43.

Bogstrand, O. & Larsson, E. (2012). *Have IFRS Contributed to an increased Value-Relevance?: The Scandinavian Evidence (*Master thesis, Uppsala University). Obtained from http://www.divaportal.org/smash/get/diva2:546324/FULLTEXT01.pdf.

Brown, S., Lo, K., & Lys, T. (1999). Use of R2 in accounting research: measuring changes in value relevance over the last four decades. *Journal of Accounting and Economics, 28(2)*, 83-115.

Christensen, P. & Feltham, G. (2012). *Economics of Accounting: Information in markets.* Springer.

Christie, A. (1987). On cross-sectional analysis in accounting research. *Journal of Accounting and Economics, 9(3),* 231-258.

Collins, D., Maydew, E., & Weiss, I. (1997). Changes in the value-relevance of earnings and book values over the past forty years. *Journal of accounting and economics, 24(1)*, 39-67.

Collins, D., Pincus, M., & Xie, H. (1999). Equity valuation and negative earnings: The role of book value of equity. *The accounting review, 71(4),* 29-61.

Core, J., Guay, W., & Van Buskirk, A. (2003). Market valuations in the new economy: An investigation of what has changes. *Journal of Accounting and Economics, 34(1-3),* 43-67.

Deloitte (2008). Improvements to International Financial Reporting Standards 2008.

Obtained from https://www.iasplus.com/en/publications/global/ifrs-in-focus/2008/aip-2006-2008.

Deloitte (2009). Improvements to IFRSs 2009. Obtained from https://www.iasplus.com/en/publications/global/ifrs-in-focus/2009/ias-plus-newsletter-2014-improvements-to-ifrss-2009.

Deloitte (2018a). IAS 1 - Presentation of Financial Statements. In *IASPlus*. Obtained from https://www.iasplus.com/en/standards/ias/ias1.

Deloitte (2018b). IFRS 13 - Fair Value Measurement. In *IASPlus*. Obtained from https://www.iasplus.com/en/standards/ifrs/ifrs13.

Deloitte (2018c). IFRS 3 - Business Combinations. In *IASPlus.* Obtained from https://www.iasplus.com/en/standards/ifrs/ifrs3.

Deloitte (2018d). IFRS 8 - Financial Instruments: Disclosures. In *IASPlus*. Obtained from https://www.iasplus.com/en/standards/ifrs/ifrs7.

Deloitte (2018e). IAS 19 - Empolyee Benefits (2011). In *IASPlus.* Obtained from https://www.iasplus.com/en/standards/ias/ias19.

Deloitte (2018f). IFRIC 15 - Agreements for the Constriction of Real Estate. In *IASPlus*. Obtained from https://www.iasplus.com/en/standards/ifric/ifric15.

Dichev, I. & Tang, V. (2008). Matching and the changing properties of accounting earnings over the last 40 years. *The accounting review, 83(6),* 1425-1460.

Easton, P. (1985). Accounting earnings and security valuation: empirical evidence of the fundamental links. *Journal of Accounting Research, Vol. 23,* 54-77.

Easton, P. & Harris, T. (1991). Earnings as an explanatory variable for returns. *Journal of accounting research, Vol. 29(1),* 19-36.

Easton, P. & Sommers, G. (2003). Scale and the scale effect in market-based accounting research. *Journal of Business Finance & Accounting, 30(1-2),* 25-56.

Eccher, E. & Healy, P. (2003). The Role of International Accounting Standards in Transitional Economies: A study of the People's Republic of China. *Working Paper.*

Elliot, J. & Hanna, D. (1996). Repeated accounting write-offs and the information content of earnings. *Journal of accounting research, Vol. 34,* 135-155.

Epicor (2018). What is Industry 4.0—the Industrial Internet of Things (IIoT)? Obtained 19.09.2018 from https://www.epicor.com/resources/articles/what-is-industry-4-0.aspx.

EY (2009). *IFRS i Norge (5. edition).* Ernst & Young.

EY (2011a). IFRS 10, 11 and 12 on consolidation and joint arrangements. Obtained from https://www.ey.com/Publication/vwLUAssets/Consolidation_and_joint_arrangements_IFRS_10_11_12/$FILE/Consolidation_and_joint_arrangements_IFRS_10_11_12.pdf.

EY (2011b). IASB issues three new standards: Consolidated Financial Statements, Joint Arrangements and Disclosure of interests in Other entities. Obtained from https://www.ey.com/Publication/vwLUAssets/IFRS_Developments_Issue_1/$FILE/I

FRS_Developments_Issue_1_GL_IFRS.pdf.

EY (2011c). Challenges in adopting and applying IFRS 11. Obtained from https://www.ey.com/Publication/vwLUAssets/Applying_IFRS_11/$FILE/Applying_IFRS_11.pdf.

EY (2011d). IAS 19 Employee Benefits — revised June 2011. Obtained from https://www.ey.com/Publication/vwLUAssets/Applying_IFRS:_IAS_19_Employee_Benefits/$FILE/Applying%20IAS%2019%20Revisions%20for%20employee%20benefits.pdf.

Fama, E. & French, K. (1992). The cross-section of expected stock returns. *The Journal of Finance, 47(2),* 427-465.

Fama, E. & French, K. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics, 33(1),* 3-56.

Fardal, A. (2008). Regnskapsføring av inntekter og kostnader knyttet til oppføring av fast eiendom. *Magma, 4/2008.*

Finansdepartementet. (2004). *Om lov om endringer i lov 17. juli 1998 nr. 56 om årsregnskap m.v. (regnskapsloven) og enkelte andre lover (gjennomføring av EØS-regler om anvendelse av internasjonale regnskapsstandarder m.m.* (Ot.prp. nr. 89). https://www.regjeringen.no/no/dokumenter/otprp-nr-89-2003-2004-/id129316/.

Francis, J. & Schipper, K. (1999). Have financial statements lost their relevance? *Journal of accounting research, 37(2),* 319-352.

Freeman, R. & Tse, S. (1992). A nonlinear model of security price responses to unexpected earnings. *Journal of Accounting Research, 30,* 185-209.

Gjerde, Ø., Knivsflå, K. & Sættem, F. (2008). The value-relevance of adopting IFRS: Evidence from 145 NGAAP restatements. *Journal of international accounting, auditing and taxation, 17(2),* 92-112.

Gjerde, Ø., Knivsflå, K. & Sættem, F. (2011). The value relevance of financial reporting in Norway 1965-2004. *Scandinavian Journal of Management, 27(1),* 113-128.

Greene, W. (2008). *Econometric Analysis.* Pearson.

Gu, Z. (2007). A cross-sample Incomparability of R^2s and Additional Evidence on Value Relevance Changes Over Time. *Journal of Business Finance & Accounting, 34(7-8),* 1073-1098.

Hann, R., Heflin, N. & Subramanyam, K. (2007). Fair-value pension accounting. *Journal of Accounting and Economics, 44(3),* 328-358.

Haugnes, T. & Bernhoft, A. (2013). IFRS i endring enda en gang. Hvorfor? *Praktisk økonomi & finans, 29(01),* 5-13.

Hayn, C. (1995). The information content of losses. *Journal of accounting and economics, 20(2),* 125-153.

Hung, M. & Subramanyam, K. (2007). Financial statement effects of adopting international accounting standards: the case of Germany. *Review of accounting studies, 12(4),* 623-657.

IASB. (2010). The Conceptual Framework for Financial Reporting 2010. Obtained from https://dart.deloitte.com/USDART/resource/7036afd8-3f7e-11e6-95db-2d5b01548a21.

International Financial Reporting Standards Foundation. (2018). Who uses IFRS Standards? Obtained 19.09.2018 from https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/.

Investopedia (2018a). Stock Split. Obtained 07.11.2018 from https://www.investopedia.com/terms/s/stocksplit.asp.

Investopedia (2018b). Reverse stock split. Obtained 07.11.2018 from https://www.investopedia.com/terms/r/reversesplit.asp.

Knivsflå, K. (2001). Immateriell verdiskapning, rekneskapsføring og verdirelevans. *Working paper.*

Kothari, S. & Zimmerman, J. (1995). Price and return models. *Journal of Accounting and economics, 20(2),* 155-192.

Kothari, S. (2001). Capital markets research in accounting. *Journal of accounting and economics, Vol. 31(1),* 105-231.

Kvifte, S., Oppi, N., & Hansen, P. (2014). Undervurderer regnskapsprodusentene betydningen av årsregnskapsrapporteringen? *Magma, 1/2014,* 26-32.

Landsman, W. & Magliolo, J. (1988). Cross-sectional capital market research and model specification. *Accounting Review, 31(1-3),* 586-604.

Landsman, W. & Maydew, E. (2002). Has the information content of quarterly earnings announcements declined in the past three decades? *Journal of Accounting Research, 40(3),* 797-808.

Leuz, C. & Wysocki, P. (2006). Capital-market effects of corporate disclosures and disclosure regulation. Obtained from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.488.8182&rep=rep1&type =pdf.

Lev, B. (1989). On the usefulness of earnings and earnings research: Lessons and directions from two decades of empirical research. *Journal of accounting research,* 153-192.

Lev, B. & Sougiannis, T. (1996). The capitalization, amortization, and value-relevance of R&D. *Journal of accounting and economics, 21(1),* 107-138.

Lev, B. & Zarowin, P. (1999). The boundaries of financial reporting and how to extend them. *Journal of Accounting research, 37(2),* 353-385.

Li, Q., Yang, J., Hsiao, C., & Chang, Y. J. (2005). The relationship between stock returns and volatility in international stock markets. *Journal of Empirical Finance, 12(5),* 650-665.

Maydew, E. (1993). An empirical evaluation of earnings and book values in security valuation. Working paper.

Miller, M. & Modigliani, F. (1966). Some estimates of the cost of capital to the electric utility industry, 1954-57. *The American Economic Review, 56(3),* 333-391.

Newey, W. & West, K. (1987). Hypothesis testing with efficient method of moments estimation. *International Economic Review, Vol. 28(3),* 777-787.

Ohlson, J. (1995). Earnings, book values, and dividends in equity valuation. *Contemporary accounting research, 11(2),* 661-687.

Oslo Børs (2016). Børssirkulære nr. 4/2016. Obtained from https://www.oslobors.no/Oslo-Boers/Regelverk/Boerssirkulaerer-arkiv/4-2016-Endringer-i-aksjeutstederreglene-paa-Oslo-Boers-og-Oslo-Axess.

Penman, S. (1998). A synthesis of equity valuation techniques and the terminal value calculation for the dividend discount model. *Review of Accounting Studies, 2(4),* 303-323.

Petroni, K., & Wahlen, J. (1995). Fair values of equity and debt securities and share prices of property-liability insurers. *Journal of Risk and Insurance,* 719-737

Picker, R., Clark, K., Dunn, J., Kolitz, D., Livne, G., Lofthus, J., & Van der Tas, L. (2016). *Applying IFRS Standards* (4. edition). London: Wiley.

PwC (2008). IFRS 3 (Revised): Impact on earnings. Obtained from https://www.pwc.com/gx/en/ifrs-reporting/pdf/ifrs3r.pdf.

PwC (2010). A practical guide to IFRS 7. Obtained from https://www.pwc.com/gx/en/ifrs-reporting/pdf/a_practical_guide_to_ifrs_7.pdf.

PwC (2013). Risikopremien i det norske markedet 2013 og 2014. Obtained from https://www.pwc.no/no/publikasjoner/verdivurdering/risikopremien-2013-2014.pdf

PwC (2014). Risikopremien i det norske markedet. Obtained from https://www.pwc.no/no/publikasjoner/verdivurdering/risikopremien-2014-2015.pdf

PwC (2016). Risikopremien i det norske markedet. Obtained from https://www.pwc.no/no/publikasjoner/verdivurdering/risikopremien-2016.pdf

PwC (2017). Risikopremien i det norske markedet. Obtained from https://www.pwc.no/no/publikasjoner/pwc-markedsrisikopremie-2017.pdf

Sondstrom, N. & Sun, K. (2007). IFRS adoption and accounting quality: a review. *European Accounting Review, 16(4),* 675-702.

Steinheim, T. (2010). Nye IFRS-krav til nedskrivning av goodwill. *Magma, 1/2010.*

Stendal, L. & Nordgarden, T. (2015). *Virkelig verdimåling for ikke-finansielle eiendeler i IFRS* (Master thesis, Norges Handelshøyskole). Obtained from https://brage.bibsys.no/xmlui/handle/11250/300468.

Sælleg, E. & Oppi, N. (2014). Endringer i IFRS. *Praktisk økonomi & finans*, *01/2014*, 3-15.

Sælleg, E. (2014). Endringer i IFRS. *Praktisk Økonomi & finans, 04/2014,* 287-295.

Theil, H. (1971). *Principles of Econometrics*. New York: Wiley.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, *Vol. 48(4),* 817-838.

Wooldridge, J. (2012). *Introductory Econometrics* (5. edition). Cengage Learning Inc.

Appendix

Appendix A: Changes to IFRS since 2005

A.1 IFRS 3 *Business Combinations*

IFRS 3 *Business Combinations* was originally issued in 2004. In 2008, a revised version was issued, and we will in the following present the most central changes.

The most central changes were within the consideration-section, and these changes affected both the goodwill measurement and ongoing earnings (PricewaterhouseCoopers [PwC], 2008). In the revised IFRS 3, acquisition costs have to be expensed as they are no longer defined as a part of the acquisition price (PwC, 2008). Secondly, the consideration now includes all interest that the acquirer has held previously in the target firm, measured at fair value. Thirdly, the acquirer can now, on a transaction basis, choose between measuring non-controlling interest at the full fair value or fair value of their proportion of identifiable assets and liabilities (PwC, 2008, p. 11). The method before the revision was similar to the latter one, and choice of method will affect the goodwill measurement (Stenheim, 2010). However, the choice of method is only of matter when under 100% of the target firm is purchased, and acquisitions of listed firms are seldom for less than 100% of equity shares (PwC, 2008, p. 12). Finally, contingent consideration now must be measured at fair value, which affects the goodwill computing (Deloitte, 2018c). If the fair value measurement of a contingent consideration classified as a liability change, this change must be recognized in earnings, not against goodwill as before the revision (PwC, 2008).

Further, the revised IFRS 3 also affects IAS 38, see *Appendix A.2.*

A.2 IAS 38 *Intangible Assets*

IAS 38 *Intangible Assets* regulates the accounting of intangible assets. The current IAS 38 was revised in 2004 and amended in 2008 and 2009.

In 2008, the first major subject of the amendment was advertising and promotional activities. The amendment clarified under which circumstances a firm could recognize a prepayment asset for advertising or promotional expenditure and included mail-order catalogs as a form of advertising and promotional activities (Deloitte, 2008, p. 5). The second major subject of the amendment was the unit of production method of amortization. Before the amendment, the wording indicated that firms could not use the unit of production method if it resulted in a lower amount of accumulated amortization than under the straight-line method. The amendment clarified that the unit of production method could be used when the resulting amortization charge reflects the expected pattern of consumption of the expected future economic benefits embodied in an intangible asset (Deloitte, 2008, p. 5).

In 2009, the first major amendment was a consequence of IFRS 3 (revised in 2008). IFRS 3 includes a presumption that all identifiable intangible assets acquired in a business combination satisfy the requirements for recognition (EY, 2009, p. 127). The practical effect for IAS 38 was, therefore, an increased recognition of intangible assets at the expense of goodwill (EY, 2009, p. 163). The second major subject of the amendment was measuring the fair value of an intangible asset acquired in a business combination. The description of valuation techniques commonly used by firms when measuring the fair value of intangible assets acquired in a business combination that are not traded in active markets was clarified (Deloitte, 2009, p. 2).

A.3 IFRS 7 *Financial Instruments: Disclosures*

IFRS 7 *Financial Instruments: Disclosures*, replacing IAS 30 *Disclosures in the Financial Statements of Banks and Similar Financial Institutions*, was issued in 2005 with effect from 2007 (Deloitte, 2018d). Unlike IAS 30, which only applied to banks and similar financial firms, IFRS 7 applies to both financial and non-financial firms with financial instruments (PwC, 2010; Accountancy Daily, 2005). The disclosures required by IFRS 7 provide an overview of the firm’s use of financial instruments, the extent of risk and its nature arising from those financial instruments, both in quantitative and qualitative terms (Deloitte, 2018d). In 2008, a revised version was issued with effect from 2009, where the aim was to enhance disclosures about liquidity risk and fair value (Deloitte, 2018d). The impact of IFRS 7 was that all firms who have financial instruments must disclose them, thus disclosing the method and assumptions used to calculate fair value, which provides equity investors, lenders and other creditors with more relevant information and gives a higher quality of the accounting information.

A.4 IFRIC 15 *Agreements for the Construction of Real Estate*

IFRIC 15 A*greements for the Construction of Real Estate* became effective in 2009. IFRIC 15 provides guidance on how to determine whether an agreement for the construction of real estate is within the scope of IAS 11 *Construction Contracts* or IAS 18 *Revenue* and, accordingly, when revenue from the construction should be recognized (Deloitte, 2018f).

The expected effect of IFRIC 15 was that firms that originally recognized revenue as construction progresses, now had to recognize revenue at completion or after delivery for the following agreements:

(1) Agreements that no longer meet the definition of a construction contract by IFRIC 15, and
(2) Agreements that do not transfer the buyer control and the significant risks and rewards of ownership of the work in progress in its current state as construction progresses (Deloitte, 2018f).

In Norway, the common practice before IFRIC 15 was to follow IAS 11. IFRIC 15 limits this possibility, implying that a bigger portion of contracts had to be recognized in accordance with IAS 18 (Fardal, 2008). Furthermore, IFRIC 15 was expected to impact other sectors since the definition of a construction contract and the following accounting is not limited to the real estate industry (Fardal, 2008).

A.5 IAS 19 *Employee Benefits*

The amended version of IAS 19 *Employee Benefits* became effective in 2013 (Deloitte, 2018e). Before the amendment, IAS 19 allowed three different methods for recognizing actuarial gains and losses; (1) an immediate recognition of the total amount through OCI, (2) through profit and loss or (3) a deferred recognition through profit or loss (corridor approach) (Deloitte, 2018e).

The most important aspect of the amendment was that the corridor approach, which allowed parts of actuarial gains and losses to be held outside the balance sheet, was eliminated (EY, 2011d; Sælleg & Oppi, 2014).This was a significant change for firms who applied the corridor approach, as defined benefit pension commitments often represent a firm’s largest single financial liability (ACCA, 2011). A research on the financial statement of 2011 for all firms listed on OSE, identified that of those using the corridor approach (67%), nine out of ten had actuarial losses. This implies that their book value of liabilities was too low and the book value of equity too high (Bernhoft & Hansen, 2014). The amendment of IAS 19 would, therefore, have the effect of lowering book value of equity for those firms.

A.6 IFRS 13 *Fair Value Measurement*

IFRS 13 *Fair Value Measurement* became effective in 2013 (Deloitte, 2018b). IFRS 13 applies to all fair value measurements when fair value is required or permitted by IFRS, with some limited exceptions (Bernhoft & Hansen, 2014). Before IFRS 13, the guidance on how to measure fair value was limited and described in each standard that required/permitted measuring of assets/liabilities at fair value, which lead to inconsistent practice (Picker et al., 2016, p. 50). IFRS 13 did not change the requirements for which assets/liabilities that should be measured at fair value, and most of the principles in IFRS 13 correspond to how fair value was measured before 2013 (Bernhoft & Hansen, 2014).

A.7 IFRS 10, 11 & 12 *Consolidation Standards*

IFRS 10 *Consolidated Financial Statements*, IFRS 11 *Joint Arrangements,* and IFRS 12 *Disclosure of Interests in Other Entities* became effective for firms domiciled within the EU and EEA-area in 2014 (Sellæg, 2014). These standards were developed as a response to the financial crisis in 2008 when the existing standards were criticized for permitting certain risky arrangements to be excluded from a firm's balance sheet (EY, 2011b). For most firms, the implementation of these new standards had little to no consequences for which firms to consolidate and how to do it (Sellæg, 2014).

IFRS 10 *Consolidated Financial Statements*

IFRS 10 replaced the portion of IAS 27 *Consolidated and Separate Financial Statements* that addressed the accounting for consolidated financial statements and included the issues raised in SIC-12 *Consolidation – Special Purpose Entities* (EY, 2011b). IFRS 10 did not change how to consolidate a firm. The major change was that the definition of having "control" of another firm, which affected when the controlled firm had to be consolidated into the controlling firm's balance sheet. The new definition could change control, but IFRS 10 was expected to increase the possibility that a firm was deemed to have control over another firm (EY, 2011a).

IFRS 11 *Joint Arrangements*

IFRS 11 replaced IAS 31 *Interests in Joint Ventures* and SIC-13 *Jointly Controlled Entities – Non- Monetary Contributions by Ventures* (EY, 2011b). IFRS 11 adopted the definition of "control" from IFRS 10, meaning that more arrangements might qualify as joint arrangements under IFRS 11 (EY, 2011c). Further on, IFRS 11 combined the categories jointly controlled assets and jointly controlled operations from IAS 31 to just joint operations (BDO, 2013). The categories in IFRS 11 are joint operations and joint venture, and it is no longer the legal structure of the arrangement that decides the classification. The deciding factors are the rights and obligations (BDO, 2013). This change was important as the classification determines the following measurement. The major change because of IFRS 11 was within measuring of joint ventures, where the former proportionate consolidation method was eliminated. This means that the only accepted method for joint ventures is the equity method. In 2008, EY investigated the financial statements of 2007 for 64 Norwegian and 25 international listed firms and found that 2/3 of firms that had investments in joint ventures used the consolidation-method and 1/3 used the equity method (EY, 2009, p. 426). This implicates that the change was widespread.

One major difference between the consolidation method and the equity method was the presentation (EY, 2009, p. 438). Under the consolidation method, the investment in a joint venture was shown line-by-line in both the consolidated income statement and balance sheet. Under the equity method, the investment in a joint venture is shown as one line in the consolidated income statement and one line in the balance sheet. One can, therefore, argue that the investor now has less relevant accounting information and that the quality of the accounting information has decreased.

Within accounting, the first major difference was that under the equity method, there are limitations on recognizing negative earnings (EY, 2009, p. 438). Meaning, the share of losses in the joint venture is not recorded after the investments carrying amount is reduced to zero (BDO, 2013, p.54). The second major difference was that under the equity method the impairment-consideration must be made for the entire investment, including goodwill, meaning that the reversing limit for goodwill is not applicable (EY, 2009, p. 438). Under the consolidation method the impairment-consideration had to be made for each cash flow-generating unit and goodwill separately (EY, 2009, p. 438).

IFRS 12 *Disclosure of Interests in Other Entities*

With the implementation of IFRS 10 and 11, firms must disclose in accordance with IFRS 12. IFRS 12 replaced IAS 27 related to consolidated financial statements, IAS 31 and IAS 28 *Investments in Associates and Joint Ventures* (EY, 2011b). The most major changes introduced by IFRS 12 was the requirements of the disclosures related to subsidiaries, joint ventures and interests in another firm which are not consolidated to be combined into a single disclosure (EY, 2011a; EY, 2011b). This provides better information for the investor and thus higher quality of accounting information.

Appendix B: Additional Statistics for *Chapter 4*

B.1 Pooled Price Regression Controlling for Industry Fixed Effects

Table B-1: Pooled Price Regression with IND

Variables	**Coefficients**
BVPS’	1.12***
EPS	2.78***
Oil Equipment and Services	-172.52*
Construction and Materials	-149.66
Electricity	83.37
Food Producers	-158.21
Industrial Engineering	-152.93
Industrial Transportation	-183.01*
Oil and Gas Producers	-158.70
Software and Computer Services	-156.69
Support Services	-150.32
Mining	-173.52*
Household Goods and Home Construction	-142.04
General Retailers	-131.66
Technology Hardware and Equipment	-148.08
Electronic and Electrical Equipment	-164.40
Travel and Leisure	-155.16
Industrial Metals and Mining	-169.18*
Real Estate Investment and Services	-236.72**
Pharmaceuticals and Biotechnology	-158.16
General Industrials	-158.84
Mobile Telecommunications	-114.56
Unclassified	-167.31*
Food and Drug Retailers	-167.33
Forestry and Paper	-178.82*
Aerospace and Defense	-165.57
Chemicals	-140.45
Personal Goods	-165.88
Food and Drug Retailers	-167.33
Health Care Equipment and Services	-144.67
Leisure Goods	-164.05
Constant	168.40*
R^2	0.78

The stars represent the p-value where * p <0.10,** p<0.05, *** $p < 0.01$. $BVPS'$ is the adjusted book value of equity per share. EPS is equity per share. We correct for problems of heteroscedasticity by using heteroscedasticity robust standard errors. All industries besides *Media* are dummies; *Media* is the reference group. The pooled price regression model controlling for industry fixed effects is $MVE = \beta_0 * IND + \beta_1 BVPS' + \beta_2 EPS + \epsilon$

B.2 Decomposition of the Explanatory Power

Table B-2: Decomposition of the Explanatory Power

Year	Total R^2 R^2_T	Incr. BVPS′ $R^2_{BVPS'}$	Incr. EPS R^2_{EPS}	Common R^2 R^2_{COMMON}
2005	0.46	0.05	0.00	0.41
2006	0.58	0.15	0.05	0.39
2007	0.66	0.09	0.03	0.54
2008	0.71	0.62	0.00	0.10
2009	0.90	0.25	0.03	0.62
2010	0.92	0.08	0.03	0.81
2011	0.88	0.23	0.05	0.61
2012	0.91	0.04	0.04	0.84
2013	0.91	0.51	0.01	0.39
2014	0.82	0.38	0.02	0.42
2015	0.80	0.51	0.10	0.20
2016	0.85	0.18	0.11	0.57
2017	0.88	0.26	0.09	0.53
Pooled	0.74	0.29	0.04	0.41

The total R^2, R^2_T, is the explanatory power from the price regression model (6). Incremental explanatory power of BVPS′ (Incr. BVPS′) is calculated as the difference in adjusted R^2 for model (6) and model (8), $R^2_{BVPS'} = R^2_T - R^2_6$. Incremental explanatory power of EPS (Incr. EPS) is calculated as the difference in adjusted R^2 for model (6) model (7). $R^2_{EPS} = R^2_T - R^2_5$. The common explanatory power to both BVPS′ and EPS is calculated as the residual, $R^2_{COMMON} = R^2_T - R^2_{BVPS'} - R^2_{EPS}$.

B.3 Summary Statistics for SHARES

Table B-3: Summary Statistics for SHARES, Used to Calculate EPS

Variable	Mean	St.Dev	p25	Median	p75
SHARES	212.70	493.49	27.25	69.30	167.33

SHARES is number of shares outstanding (common stock) (in millions).

B.4 Summary Statistics for EARN and LOSS

Table B-4: Summary Statistics for Variables Used to Calculate LOSSTEN

Variable	Mean	St.Dev	p25	Median	p75
EARN	483.24	4161.20	-45.81	19.22	255.23
LOSS	0.40	0.49	0.00	0.00	1.00

EARN is Net income available to common shareholders (in millions). *LOSS* is a dummy, where *LOSS* = 1 if *EARN* < 0, LOSS = 0 if *EARN* > 0.

B.5 Summary Statistics for ASSETS, INTAN and FINANCIAL

Table B-5: Summary Statistics for Variables Used to Calculate INTANTEN and FAIR

Variable	Mean	St.Dev	p25	Median	p75
ASSETS	14236.79	67907.62	537.05	2167.04	8144.61
INTAN	1041.66	6232.32	0.00	29.99	216.94
FINANCIAL	1950.62	12034.97	21.27	148.32	708.16

ASSETS is total assets (in millions). *INTAN* is total intangible assets (in millions), excluding goodwill. Goodwill is excluded as it is out of the scope of IAS 38. *FINANCIAL* is financial assets (in millions) calculated as:

$FINANCIAL_t$ = *Short-term investments*$_t$ *(BS_MKT_SEC_OTHER_ST_INVEST)*
+ *Long-term investments*$_t$ *(BS_LONG_TERM_INVESTMENTS)*
+ *Derivatives and hedging assets short-term*$_t$ *(BS_DERIV_&_HEDING_ASSETS_ST)*
+ *Derivatives and hedging assets long-term*$_t$ *(BS_DERIV_&_HEDING_ASSETS_LT)*
+ *Account and notes receivables short-term*$_t$ *(BS_ACCT_NOTE_RECV)*
+ *Long-term receivables*$_t$ *(BS_LT_RECEIBABLES)*
+ *Long-term marketable securities*$_t$ *(BS_LT_MARKETABLE_SECURITIES)*

The assets included in financial assets are chosen because they are measured at fair value in accordance with IAS 39 *Financial Instruments: Recognition and Measurement*. We have not included investments in associated firms since these are measured after the equity method (IAS 28 *Investments in Associates and Joint Ventures*).

Appendix C: Overview of VRM-Variables Used in Time Regression Models (2-5)

Table C-1: Overview of VRM-Variables Used in Time Regression Models (2-5)

Regressions	VRM-variable
A	Total R^2 from price regression model (6)
AA	Total R^2 from price regression model (6) using market value of equity delayed
AAA	Total R^2 from price regression model (6) with 2% winsorizing
B	Incr. BVPS′ from *Table 4-2*
BB	Incr. BVPS′ from *Table 4-2* with market value of equity delayed
BBB	Incr. BVPS′ from *Table 4-2* with 2% winsorizing
B-2	BRC from price regression model (6)
BB-2	BRC from price regression model (6) with market value of equity delayed
BBB-2	BRC from price regression model (6) with 2% winsorizing
B-A	Incr. BVPS′ from *Table 4-2* corrected for first-order autocorrelation in the residuals by using Newey-West standard error
C	Incr. EPS from *Table 4-2*
CC	Incr. EPS from Table 4-2 using market value of equity delayed
CCC	Incr. EPS from *Table 4-2* with 2% winsorizing
C-2	ERC from price regression model (6)
CC-2	ERC from price regression model (6) using market value of equity delayed
CCC-2	ERC from price regression model (6) with 2% winsorizing
C-A	Incr. EPS from *Table 4-2* corrected for first-order autocorrelation in the residuals by using Newey-West standard error
D	Common explanatory power from *Table 4-2*
DD	Common explanatory power from *Table 4-2* using market value of equity delayed
DDD	Common explanatory power from *Table 4-2* with 2% winsorizing
E	Total R^2 from return regression model (9)
F	Incr. EPSDEF from return regression model (9)
G	Incr. ΔEPSDEF from return regression model (9)
H	EPSDEF-coefficient from return regression model (9)
I	ΔEPSDEF-coefficient from return regression model (9)
DR	Common explanatory power from return regression model (9)
J	Total R^2 from abnormal return regression model (12)
K	ΔEPSDEF-coefficient from abnormal return regression model (12)

Appendix D: Summary of Results Inconsistent with Main Tests

Table D-1: Summary of Results Inconsistent with Main Tests

	Price regression model			Delayed market value of equity		Winsorizing 2%		Return regression model			Abnormal return regression model
Variable	**Total**	**Book value of equity**	**Earnings**	**Total**	**Book value of equity**	**Book value of equity**	**Earnings**	**Total earnings**	**Level earnings**	**Changes in earnings**	**Changes in earnings**
TIME	>0	0	>0	>0	<0	<0	0	<0	<0	<0	<0
TIME* INTANTEN	0	0	>0	0	0	0	>0	0	0	<0	0
TIME* FAIR	0	>0	0	<0	>0	>0	<0	0	0	0	>0

The results from robustness tests which are consistent with our main tests are not tabulated. <0 is a (at least weakly) significant negative response coefficient, 0 is an insignificant response coefficient and >0 is a (at least weakly) significant positive response coefficient.