The Value Relevance of Financial Information

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To Reidar Korsbrekke, my closest friend.

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Chapter 1: Introduction

1.1 Value relevance

Value relevance studies fall under the accounting branch of capital markets based research, and seek out to explain the valuation of securities based on a range of explanatory variables. Francis and Schipper (1999) discuss the meaning of "value relevance". In this thesis, we define value relevance as financial information's ability to hold information that investors use to price equity. One important aspect with this definition is that it assumes only the *ability* to hold information. Thus, it does not pose the restriction that the accounting variables are the direct cause of equity pricing. The variables may merely be correlated with actual information that is used in such valuation. This distinction is critical because accounting data is often not unique in presenting the underlying economic information they are supposed to captured (Beaver [2002]). As Beaver (2002) notes, accounting numbers are often highly correlated with other publically available information. Consistent with this definition of value relevance, the majority of the research aims at describing if and to what degree financial information is relevant to valuing equity. This thesis is a contribution to this positive branch in accounting research, in contrast to the normative branch. This means that we focus on describing the relationships between equity prices and financial information for what they are, and not how they ought to be.

One basic notion in this type of research is that equity price is a function of accounting information. In general, we may describe this relationship as

$$P = P\begin{pmatrix} A_{11} & A_{12} & \cdots & A_{1N} \\ A_{21} & A_{22} & \cdots & A_{2N} \\ \vdots & \vdots & \ddots & \vdots \\ A_{T1} & A_{T2} & \cdots & A_{TN} \end{pmatrix}$$

where *P* is equity price, and the *TxN* matrix is a set of *N* accounting variables *A* observed over *T* periods. The sign of $\partial P/\partial A_{tn}$ depends on whether accounting variable *n* in period *t* carries information that is relevant to increasing or decreasing equity value.

The empirical approach to assess value relevance is through regression analysis in which market value of equity, or change in such value, is explained in a linear relationship to financial variables. A standard specification is the price model where the dependent variable is price of equity (Ohlson [1995], Collins et al. [1997], Francis and Schipper [1999]). The model is expressed as

$$P_{it} = \alpha + A_{it}^{'}\beta + \varepsilon_{it}$$

where A is an accounting information vector of *N* elements. β is the vector of *N* valuation coefficients. α is a constant and ε is an error term. Each variable is given for firm *i* in period *t*.

The statistical metrics for value relevance are obtained by the valuation coefficients and R-squares, both by their magnitude and significance. Another type of model that is often used is a return model (Easton and Harris [1991], Francis and Schipper [1999]), given by

$$R_{it} = \alpha + A_{it}^{'}\beta + \Delta A_{it}^{'}\gamma + \varepsilon_{it}$$

where $R_{it} = (P_{it} - P_{i,t-1})/P_{it}$. Δ denotes the change in a variable and γ is the vector of valuation coefficients for these changes.

The remainder of this thesis is structured as follows. Section 1.2 quickly presents relevant literature. Section 1.3 introduces the two papers contained within this thesis. Thereafter the two essays are presented in chapters 2 and 3. We finally summarize in chapter 4.

1.2 Literature

Value relevance literature can fulfill three roles (Beaver [2002]): first, it can help in expressing the nature of the issues. Second, it can provide theories, both normative and positive. Third, it can provide empirical evidence. Beaver also suggests that there are certain distinctive characteristics that differs value relevance research from other capital markets research. First, value relevance researched requires an in-depth knowledge of accounting standards and features of reported numbers, and it does so more than the other branches in capital markets research. Second, the timeliness of information is not an important issue. The reason is that earnings disclosures are preempted by other information prior to the disclosure (Landsman and Maydew [2002]).

Financial accounts consist of three main components: the income statement, the balance sheet and the cash flow statement. The roles of the income statement and the balance sheet are distinctive (Barth et al. [1998]): the income statement primarily provides information for valuing equity whereas the balance sheet assists creditors in monitoring liquidation values. However, since there is a probability of default, these liquidation values also affect equity value. Previous research shows that both the income statement and book values are value relevant (e.g., Easton and Harris [1991], Collins et al. [1997], Deschow et al. [1999], Fancis and Schipper [1999]). The cash flow statement provides information by which investors may separate underlying cash flows from earnings accruals. Cash flows and accruals are also value relevant (Bowen et al. [1987], Wilson [1987], Pfeiffer and Elgers [1999]).

The value relevance of accounting information differs with various factors. Hayn (1995) argues that losses are less value relevant than positive earnings because of the liquidation option held by investors, i.e. that investors do not have the obligation to stay invested in companies whose earnings are expected to persist. Hayn's findings are consistent with this argument, and other studies also find evidence that supports Hayn's claim (e.g., Basu [1997], Joos and Plesko [2005]). Another factor is industry valuation effect. However, the evidence for this assertion is rather mixed (e.g., compare Biddle and Seow [1991] vs. Francis and Schipper [1999]).

1.3 This thesis

1.3.1 Cross-industry comparison

R&D expenditures and restructuring costs are often expensed immediately while the benefits from the same investments are recorded later. This leads to a mismatch between income and costs. Literature shows that R&D capitalization provides economic information and significant association to stock pricing (Lev and Zarowin [1999], Aboody & Lev [1998], Lev and Sougiannis [1996]).

The first paper of this thesis, **"Differences in the Value Relevance of Financial Information across Industries"**, investigates this problem. In R&D intensive industries such as computer tech and pharmaceuticals, a great portion of investments are expensed rather than capitalized. This suggests that book values and earnings carry less value relevant information in R&D intensive industries compared to other industries. We therefore hypothesize that the total value relevance of accounting information in such industries (called high-tech) are less value relevant than in other industries (called low-tech). We find no support for this, and we suspect that this may be attributed to that the R&D investments are average on losses. Our second hypothesis is that the value relevance will increase in both industries when controlling for losses (Hayn [1995], Basu [1997], Joos and Plesko [2005]). We find no support for this, and suspect that losses on average are associated with unrecognized assets such that they are value relevant to begin with (Joos and Plesko [2005], Darrough and Ye [2007]). The findings are robust to panel data methods and Gu (2007)'s approach to cross-sample comparison of pricing errors.

1.3.2 Times of crisis

The late 2000s financial crisis affected companies and economies worldwide. It led many firms into financial distress. Barth et al. (1998) suggest that as firms enter such distress, book values become increasingly important and earnings increasingly *un*important. The intuition is that markets focus more on the liquidation values in firms during times of distress. This causes a shift in the value relevance from the income statement to the balance sheet, i.e. the two part's respective value relevance move inversely to each other. Barth et al.'s prediction is supported by empirical findings (Barth et al. [1998], Collins et al. [1997]).

In the second paper of this thesis, **"The Financial Crisis' Impact on the Value Relevance of Financial Information"**, we study the impact of the late 2000s financial crisis. We hypothesize that 1) the value relevance of book values increases during the crisis, and that 2) the value relevance of earnings decreases during the crisis (Barth et al. [1998], Collins et al. [1997]). We do not find support for either hypothesis. On the contrary, we find that earnings' value relevance increases during the crisis. We believe that this is due to that the "unrecognized net assets" effect dominates the "liquidation" effect, as the two effects are described in Barth et al. (1998). Further, we think that impairments will occur more frequently and in greater portions during times of crisis. Thus, we hypothesize that the accruals component of earnings will be more relevant during the crisis. The statistical evidence supports this hypothesis.

Chapter 2: Essay 1

Differences in the Value Relevance of Financial Information across Industries

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Abstract

Norwegian Generally Accepted Accounting Principles (NGAAP) mandate that investments should be capitalized. The Accounting Act of Norway, however, allows for R&D investments to be expensed. Expensing investment costs suggests that book values and earnings carry less relevant information for pricing shares in companies who are R&D intensive as long as investments in R&D are assets on average. We divide companies listed on Oslo Stock Exchange into two groups of industries in an attempt to group the firms according to the extent they use expense accounting. Then we check whether there exists any difference in value-relevance of book values and earnings between the two groups. We find no statistical difference. This finding is kept intact when controlling for firm-specific effects, and also when using an abnormal pricing error approach suggested by previous literature to cope with the problems of cross-sample comparison of R-squared. We suspect that results are due to that investments in R&D on average are losses. As a second hypothesis we assume that controlling for negative earnings increases the value relevance. We find no evidence for this and suggest that it might be due to losses containing information on unrecognized assets that are value relevant for the firm.

2.1 Introduction

In this paper we look at firms on Oslo Stock Exchange to study the cross-industry difference in value relevance of financial information. The focus of this paper is not only on straightforward analysis of differences in value relevance on a new set of data, but also to address two problems that are often encountered in value-relevance research: 1) data characteristics of the observed panel, and 2) cross-sample comparison of R-squared.

We divide the firms into two groups of industries, namely low-tech and high-tech, a separation we believe is fair considering the difference in intensity of R&D investments in the two groups. The appropriateness of this criterion is based on the accounting treatment of R&D investments in practise, namely expensing, contrary to that of other types of investments which are capitalized. When large amounts of intangible assets are expensed, reported book values will understate a company's invested capital and earnings, provided that investments in R&D on average leads to future economic benefits so that they are assets. The intuition is that investors recognize this discrepancy, and that reported accounts therefore carry less value-relevant information for firms where intangible are not recognized on the balance sheet. A wide range of studies (e.g., Aboody and Lev [1998], Lev and Sougiannis [1996], Lev and Zarowin [1999]) find results in support of that expectation. This is also what we expect and defines our first hypothesis. Our second hypothesis is that we expected increased value-relevance in both high-tech and low-tech from controlling for losses. This hypothesis is primarily based on the findings in Hayn (1995).

We use return and price regression models that are familiar in the value-relevance research genre: 1) price explained by book equity per share and earnings per share, and 2) return explained by price-deflated earnings and price-deflated change in earnings. Difference in value relevance is measured by R-squared, and R-squared variances are estimated by bootstrapping to obtain a test statistic to test the differences. We start out by estimating our specifications by OLS. We find no evidence for that the value relevance is different between the industries, and attribute this finding to that investors perceive the investments as very risky or that R&D investments are on average losses. We do not find that the value relevance increases when controlling for losses. This finding is probably due to that a great portion of the losses may be carrying information on unrecognized assets which are value relevant for the firms.

Controlling for firm specific effects, we estimate panel data specifications using the fixed-effects (FE) estimator. The results are qualitatively the same as with OLS. Finally, we address problem with cross-sample comparison of R-squared. Gu (2007) discusses this problem and proposes several solutions. Gu suggests to look at pricing errors determined by residual dispersion or raw residuals. Contrary to R-squared, these measures always reflect the underlying economic situation. We use his abnormal pricing error approach where we adjust for scale effects. It is shown that none of the results from OLS and FE estimations change qualitatively. Our results are consistent with the view that R&D should be expensed as it is hard to demonstrate that such expenditures yield assets, i.e. future economic benefits. Also, our results indicate that the value relevance of losses is as high as for profits.

The paper is structured as follows. Section 2.2 gives a brief overview over relevant studies and develops two hypotheses. In section 2.3 we describe our methodological approach. Data are described in section 2.4. Thereafter, section 2.5 analyzes our estimation results. In the latter part of the section, we do a robustness check with panel data methods. Finally, we conclude in section 2.6.

2.2 Framework and hypotheses

The meaning of "value relevance" is discussed in Francis and Schipper (1999). We define value relevance as the ability of financial accounts to hold information that determines stock value. We are therefore interested in the degree of statistical relationship between accounting data and stock returns and prices. The definition does not necessarily pose the restriction that the financial information is the direct cause for market values or changes in market values. It could ultimately mean that the information is only correlated with information that investors actually use.

Easton and Harris (1991) investigate the association between earnings and stock returns. They conclude that both current earnings and change in earnings are value relevant. Evidence of the same is also found in e.g. Collins et al. (1997). The latter study shows along with Deschow et al. (1999) that book values are value relevant. Basically, it is evident from previous studies that both earnings and book values are value relevant for stock pricing.

Research also shows that the value relevance of financial information varies with various factors. One such factor is negative earnings. Hayn (1995) studies the information content of losses. She finds that negative earnings are less informative than positive earnings and suggests that this is due to the liquidation option held by shareholders. It is evident that controlling for losses increases the value relevance of financial information (Hayn [1995], Basu [1997], Joos and Plesko [2005]). Studies also find that losses are not perceived as homogenous by that investors separate expensed R&D from other losses (Joos and Plesko [2005], Darrough and Ye [2007]).

Another factor that affects value relevance is the presence of non-recurring items in earnings. Non-recurring items are extraordinary items or earnings from discontinued operations. Elliott and Hanna (1996) find that investors place less weight on such special items compared to earnings before special items. Collins et al. (1997) suggest that the shift of value relevance from earnings to book values over time can partly be attributed to increased non-recurring items in reported earnings.

The extent of intangible assets is also found to affect the value relevance of accounting information. R&D expenditures and restructuring costs are often expensed immediately while the benefits from the same investments are recorded later. This leads to a mismatch between revenues and costs. Lev and Zarowin (1999) show that there is an association between change in R&D spending and change in the value relevance of earnings. Aboody & Lev (1998) look at computer software companies and find that capitalization variables are associated with capital market variables and future earnings, i.e. that capitalization of intangible assets increase the value relevance of accounting information. This is also a finding in Lev and Sougiannis (1996) whose results show that R&D capitalization provides economic information and statistically significant association to stock pricing.

In this paper we are interested in cross-industry differences. One noticeable paper on industry comparisons of earnings response coefficients (ERCs) is Biddle and Seow (1991). They note that industry membership classifies companies such that they are sorted according to a wide selection of financial and economic characteristics. The paper also suggests that industry grouping reduces random variation in the cross-sections. Biddle and Seow's results show that ERCs differ across industries, and that this is due to differences in financial and operational leverage, product type, growth and industry entry barriers. Beisland and Hamberg (2008) find that value relevance is less volatile in traditional industries compared to non-traditional ones. They also conclude that there is no significant difference between the two types of industries when controlling for frequency of transitory earnings items.

In tech and R&D intensive sectors, such as health care and information and communication technology (ICT), the majority of investments are expensed and not capitalized. Francis and Schipper (1999) find mixed support for the assertion that accounting data is less value relevant for high-tech firms compared to other firms. They note that while their data gives a slight indication of support for that statement, they cannot find evidence to say that the increased number of high-tech firms is a cause for the declined value relevance in general over time. Beisland and Hamberg (2008) study Swedish market data and find that accounting information is less value relevant for high-tech firms. They question the difference between their results and the US data results in Francis and Schipper (1999). We expect financial information to be less value relevant for tech companies because the extensive use of expense accounting over capitalization (Aboody and Lev [1998], Lev and Sougiannis [1996], Lev and Zarowin [1999]). We define high-tech and low-tech industries in section 2.4.

<u>Hypothesis 1:</u> *Financial accounts are less value relevant in high-tech industries compared to low-tech ones.*

Hayn (1995) finds that negative earnings are less value relevant than positive earnings because of the liquidation option held by stockholders. Beisland (2008) uses the Easton and Harris (1991) approach and disaggregates earnings and controls for the sign of earnings. Beisland finds that the value relevance increases dramatically when controlling for the sign of reported earnings.

<u>Hypothesis 2:</u> *The value relevance of financial information increases for both high-tech and low-tech when controlling for losses.*

There may also be a connection between hypotheses 1 and 2. That is, the difference in value relevance proposed by our first hypothesis might be less when controlling for losses.

2.3 Empirical method

The basic idea in value relevance literature is that market value of equity or changes in market value of equity may be expressed as a function of accounting variables. We will use both a price and a return specification. Our models in their simplest forms are

(1a) $P_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \varepsilon_{it}$

(2a) $R_{it} = \alpha + \beta_1 EARN_{it} + \beta_2 \Delta EARN_{it} + \varepsilon_{it}$

where *P* is the end-of-period stock price, *R* is end-of-period to end-of-next-period return ($R_{it} = [P_{it} - P_{i,t-1}]/P_{i,t-1}$), *BVS* is book value per share, *EPS* is earnings per share, *EARN* is price-deflated earnings ($EARN_{it} = EPS_{it}/P_{i,t-1}$), *ΔEARN* is price-deflated change in earnings ($\Delta EARN_{it} = [EPS_{it} - EPS_{i,t-1}]/P_{i,t-1}$) and *ε* is the residual error term. All variables are denoted for firm *i* in period *t*. Earnings are given by net income reported in period *t* for the earnings period *t-1* to *t*. Specification (1a) is based on the framework in Ohlson (1995). (2a) is based on, e.g., Easton and Harris (1991). In the price regression we have already scaled the explanatory variables by dividing each of them with number of outstanding shares of the firm. In the return regression we scale the explanatory variables by dividing by the market value of equity at the end of the previous period. This scaling approach is used by Easton and Harris (1991) and is supported by Easton and Sommers (2003).

To statistically assess the degree of value relevance consistent with our definition of value relevance, the primary indicator, as applied in most relevant literature, is R-squared. In this paper we will use adjusted R-squared to penalize inclusion of additional variables. We will refer to adjusted R-squared only as R-squared for the remainder of this paper.

To evaluate a variable's incremental value relevance we use the method applied in Collins et al. (1997). To exemplify, consider the regression model $y = \alpha + \sum_{i=0}^{N} \beta_i x_i + \varepsilon$. Denote the R-squared from regression *y* on all *N* explanatory variables as R_{full}^2 and R-squared from regressing *y* on x_i as R_i^2. The incremental value relevance of accounting variable x_i, $R_{x_i}^2$, is then given by $R_{x_i}^2 = R_{full}^2 - \sum_{j=0}^{N} R_{j \neq i}^2$. The value relevance common to all *N* explanatory variables is then calculated as $R_{common}^2 = R_{full}^2 - \sum_{i=0}^{N} R_{x_i}^2$.

R-squared's significance is tested by the T statistic $\hat{R}_i^2 / se(\hat{R}_i^2)$ where $\hat{R}_i^2$ is R-squared from estimated from either specification (1a) and (2a) on industry group *i*. We can compare differences in value relevance across sectors by testing the differences in R-squared between industry samples *HT* (high-tech) and *LT* (low-tech). The test statistic is then $(\hat{R}_{HT}^2 - \hat{R}_{LT}^2)/se(\hat{R}_{HT}^2 - \hat{R}_{LT}^2)$. We cannot determine if the value relevance is significant from running one regression. To evaluate an R-squared's significance or a significance of a difference between R-squares we need to estimate variance to calculate standard error. We use bootstrapping to accomplish this. So for each repetition *r ϵ 1,2,…,T* we select *x* observations randomly and calculate R_r^2 using those observations. From the bootstrapped observations we calculate a standard deviation.

We must also consider the non-linearity in the value relevance of earnings as proposed by Hayn (1995). With this we mean that the value relevance of earnings is not only related to the level but also to the sign of earnings. To control for negative earnings we include a dummy for the sign of earnings:

(1b) $P_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \delta(LOSS_{it} * EPS_{it}) + \varepsilon_{it}$

(2b) $R_{it} = \alpha + \beta_1 EARN_{it} + \beta_2 \Delta EARN_{it} + \delta(LOSS_{it} * EARN_{it}) + \varepsilon_{it}$

where $LOSS_{it}$ is a dummy set to 1 if reported earnings in period *t* are negative for company *i*, else it is zero. Hypothesis 2 is then tested by the T statistic $(\hat{R}_{i,LOSS}^2 - \hat{R}_i^2)/se(\hat{R}_{i,LOSS}^2 - \hat{R}_i^2)$ where $\hat{R}_{i,LOSS}^2$ is R-squared when controlling for loss in sample *i*.

Finally we would like to control for time-specific factors that are not explicitly controlled for in the previous specifications (e.g., see Amir and Lev [1996]). We do this by simply including year dummies in the (1b) and (2b) specifications. Thus we have:

$$(1c)\ P_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \delta(LOSS_{it} * EPS_{it}) + \textstyle\sum_{q=s}^{T-1} TD_{qt} + \varepsilon_{it}$$

$$(2c)\ R_{it} = \alpha + \beta_1 EARN_{it} + \beta_2 \Delta EARN_{it} + \delta(LOSS_{it} * EARN_{it}) + \textstyle\sum_{q=s}^{T-1} TD_{qt} + \varepsilon_{it}$$

where TD_{qt} is a time dummy set to one if $q=t$, else zero. T is the final year in the sample and s is the starting year.

Accounting research is the only research field in which cross-sample comparison of R-squared is extensively used. Gu (2007) explains how scaling problems affect the comparison of R-squared between samples. When we do cross-sample comparison of R-squared we cannot distinguish between difference caused by different sampling properties or different economic relationships. Gu points out that even if we are not suffering from scale or heteroscedasticity problems, R-squares may still be incomparable between samples. To check the validity of R-squared inference results, he proposes an abnormal pricing error approach. We use this method in section 2.5.3 to check the validity of the test results we get from bootstrapping the R-squared standard deviation.

For each specification, we do for each of our two samples (high-tech and low-tech): we first estimate the model and obtain the fitted values of the explained variable, $\hat{y}_{it}$, and the predicted residuals, $\hat{\varepsilon}_{it}$. We then divide each sample into ten based on deciles of $|\hat{y}_{it}|$. For each decile, we use the observations in the respective deciles to calculate a benchmark pricing error (BPE) as the mean absolute residual, i.e. $BPE = \frac{1}{N}\sum |e_{it}|$, where N is the number of observations within the decile. Next we calculate the abnormal pricing error (APE) as the difference between the absolute residual for observations and the BPE in the observations' deciles, so $APE = |e_{it}| - BPE$. Finally, we calculate a mean abnormal pricing error (MAPE) within a sample as the average APE in that sample, with $MAPE = \frac{1}{N}\sum APE$. Hypothesis 1 is then tested by the T statistic $(MAPE_{HT} - MAPE_{LT})/se(MAPE_{HT} - MAPE_{LT})$. Hypothesis 2 is checked by the T statistic $(MAPE_i - MAPE_{i,LOSS})/se(MAPE_i - MAPE_{i,LOSS})$ for $i = HT, LT$.

2.4 Data

We analyze exchange listed firms on Oslo Stock Exchange (OSE) from 1992 to 2004. Starting in 1992 is convenient since Norway changed its accounting code effective from that year. This legislative change introduced deferred tax liabilities and assets. Ending in 2004 is appropriate because of the introduction of International Financial Reporting Standards (IFRS) accounting from 2005. IFRS differ from Norwegian GAAP (NGAAP), mainly by that it is more balance sheet focused with emphasis on fair value where NGAAP uses historical cost. Both the stock price and accounting data are retrieved from the Norwegian School of Economics and Business Administration's Stock Market Database.[1]

Bhojraj et al. (2003) compares industry classification schemes and find that GICS does a significantly better job at explaining cross-sectional variations. We therefore group our companies into sectors according to the two first digits of their GICS number.[2] The firms are therefore divided into the ten following sectors (GICS sector number): energy (10), materials (15), industrials (20), consumer discretionary (25), consumer staples (30), health care (35), financials (40), information technology (45), telecommunications services (50) and utilities (55). In the raw database many observations are missing GICS value because the GICS classification scheme was not adopted by OSE at the start of the observation period. To correct for this we use a generic approach and set the missing GICS values to the firms' GICS in in a nearby year. This, however, does not correct for the companies who delisted during the observation period and never had a GICS number on record, or firms that are never marked with a GICS value. Most of these observations are self-owned savings banks typically with a regional focus. Because they are savings banks they are enlisted with primary capital certificates and not ordinary shares. Also, because banks and other financial firms have structurally different accounts than firms in other industries, we remove all financial companies from the dataset. There is also on average only one utilities firm enlisted. This is due to that most utilities firm operating in Norway are private companies. There is also only one telecommunications firm listed on average, and Telenor has been the only consistent one since 2001. We finally divide firms into two main groups according to the hypotheses in section 2.3.2: 1) "high-tech" with companies from the health care, IT and telecommunications industries, and 2) "low-tech" with firms from industries that are not included in the high-tech group.

Observations with missing values are dropped. We also remove outliers such that our results are not affected by merely a few observations with extreme values. We define an outlier as an observation where one of the variables is at or above the 99th percentile, or at or below the 1st percentile. In total 148 observations (~8.7 %) are removed during this cleanup. Obtaining standardized residuals, $\hat{\varepsilon}/\hat{\sigma}_{\varepsilon}$, from preliminary regressions of specification (1a) and (2a) reveals that we still have extreme outlying residuals. We remove 65 observations (~4.2 %), where $|\hat{\varepsilon}|/\hat{\sigma}_{\varepsilon} \geq 3$ either by specification (1a) or (2b) regressed on the full sample. We are left with 1,493 firm-year observations after cleanup; 280 in high-tech industries, and 1,213 in others.

[1] Thanks go to Erling Johan Frøysa who did a customized data extraction upon request.

[2] The MSCI Barra GICS structure scheme was acquired at http://www.mscibarra.com/resources/xls/GICS_map2010.xls (February 1, 2011).

Summary statistics are found in table 2.4.1. The highest average EPS is found in the low-tech industries. There is much more variation in EPS in high-tech; for those industries, the standard deviation is over 15 times the mean, while it is only double the mean for low-tech. We see the same tendency for BVS and EARN. EARN shows the most extreme difference. For high-tech companies, the standard deviation of price-deflated earnings is 25 the mean. The same number is 3 in low-tech industries. The exception to this pattern is ΔEARN.

[Insert Table 2.4.1 about here]

Table 2.4.2 tabulates correlations. Pearson correlations are above the diagonals while Spearman correlations are below. Returns are significantly correlated with both EARN and ΔEARN in both industry groups, except for the Pearson correlation with ΔEARN in high-tech. Prices are correlated with both BVS and EPS for both high- and low-tech, but the Pearson correlation is less significant for high-tech (5 % level) than for low-tech (1 % level). EARN and ΔEARN, and BVS and EPS are significantly correlated in all samples, respectively.

[Insert Table 2.4.2 about here]

Average P/B and P/E are plotted by year and industry group in figure 2.4.1. Only observations with positive earnings are used for the P/E illustration and only observations with book values of equity are used for the P/B calculations. Average P/B in high-tech is always higher than in low-tech. The average high-tech P/B spikes in 1997 and 2004 at 8. In low-tech industries, the average P/B is always between 0 and 2. The mean P/E is lower for high-tech companies up till 1995. After that it is extremely volatile varying from 20 to 100. In low-tech industries it is usually around 20, but it tops at 40 in 2003.

[Insert Figure 2.4.1 about here]

2.5 Empirical analyses

2.5.1 Basic approach

OLS regression and bootstrapping estimates for all specifications are listed in table 2.5.1. We consider specification (1a) first. Full R-squared is 24.3 % for low-tech while it is 28.8 % in high-tech industries, both significant at the 1 % level with t-values 11.20 and 3.36, respectively. While there is a difference in absolute value, this difference is not significant (t-value = 0.50). The incremental value-relevance of BVS is higher in high-tech (26.8 %) than low-tech (7.1 %). This difference is statistically significant at the 5 % level (t-value = 2.48). EPS, however, does not apparently carry any significant incremental value relevance in either sample. R-squared common to both BVS and EPS is 16.2 % in low-tech industries but close to zero in high-tech. The difference is significant at the 1 % level. The BVS coefficient is statistically significant in both samples. The coefficient in the high-tech sample is estimated to be five times greater than that of low-tech. The difference is significant at the 1 % level. The EPS coefficients differ substantially, but it is only significant in low-tech (t-value = 3.41). It is not significantly different between the two samples. We have so far detected that the incremental explanatory power of the balance sheet is greater in high-tech than in low-tech. For the income statement no difference is detected. We also found that the BVS coefficient is greater in high-tech than low-tech, so the balance sheet seems more important in high-tech, while the income statements seems more important in low-tech.

Turning to return specification (2a), full R-squares (7 %) are still significant for both groups. The small fourth decimal difference is not significant. The incremental R-squared of reported earnings is significant in both samples and is 6.2 % in low-tech and 6.9 % in high-tech. This difference is not significant (t-value = 0.21). Change in earnings has very low incremental value-relevance and R-squared common to both earnings and change in earnings are close to zero, all of which are not significant. The insignificant incremental value relevance of earnings detected by price regressions is confirmed by our return regressions. The EARN coefficient is significantly greater in high-tech than low-tech at the 1 % level. Thus, we have indications that reported earnings are more important in high-tech than low-tech. This finding is consistent with the difference in EPS coefficient found above.

With respect to our first hypothesis, we notice that the only significant differences in R-squares are in (1a) and are 1) that of BVS incremental explanatory power, in favor of high-tech having the greatest, and 2) the common R-squared to BVS and EPS, in favor of low-tech. These differences are not significant when controlling for losses and year effects. Thus, we find no support for hypothesis 1 from our T tests.

[Insert Table 2.5.1 about here]

When controlling for losses we find by specification (1b) that the incremental explanatory power of the balance sheet decreases and the common R-squared increases in the complete sample, but both not significantly so (see table 2.5.2). Neither the EPS nor the BVS coefficient changes significantly in the full sample when controlling for losses. Value relevance measured by full R-squared increases in high-tech industries only. The R-squares' significance is kept intact compared to specification (1a), but the cross-industry difference is still insignificant. However, the incremental R-squared of BVS decreases in both industry groups, and extremely so in high-tech industries in which it over halves from 26.8 % to 11.2 %. It drops 1 percentage point in low-tech. The differences in these R-squares are insignificant, which also is true for all the other R-squared differences. The incremental R-squared of EPS and LOSS*EPS is insignificant. Perhaps most interesting is the dramatic increase in the common value relevance to both BVS and EPS in high-tech industries; it goes from being 1 % and insignificant to 16.6 % and significant at the 1 % level. The EPS coefficient is now insignificant in low-tech. By controlling for losses in high-tech, the EPS coefficient goes from -0.898 to 0.392, and the BVS coefficient drops from 1.030 to 0.863. Changes are in the same direction in low-tech industries, but the differences are not that extreme. While the coefficients before and after controlling for losses are not significantly different between the two specifications in either sample at the 5 % level, the changes in the estimates may be an indication of a shift in investor appreciation of the respective parts of the financial statements when taking into account losses. This means that while we do not find a significant increase in value-relevance by R-squared, that the value of the individual components may have changed. The BVS coefficient is significantly greater in high-tech than low-tech at the 1 % level. The EPS coefficient is not significantly different between the two industry groups. The return specification (2b) does not show any interesting changes in R-squares when controlling for negative earnings, but the earnings coefficient increases in both industry samples. The new earnings coefficients are not significantly different from the (2a) coefficients at the 5 % level.

Considering our second hypothesis, we check the differences in R-squares by T tests. The results for the T tests with the null hypothesis that the difference in R-squares from controlling for losses is zero, are listed in table 2.5.2. We do a two-sided test, so the critical value at the 5 % level with our degrees of freedom is 1.96. We see that the only significant increase (at the 5 % level) is in the R-squared common to both BVS and EPS in high-tech industries. None of the full R-squares are significantly different, and we therefore do not have any evidence in favor of hypothesis 2. While this may be surprising, it might be that on average the losses in the sample are associated with unrecognized assets, in which case they are value relevant (Joos and Plesko [2005], Darrough and Ye [2007]).

It is interesting to see if controlling for losses alters our conclusion from our first hypothesis. Even when controlling for losses, the t-values from testing the difference in R-squares between the industry groups are low and our conclusions regarding hypothesis 1 is not changed when taking the signs of earnings into account.

Time dummy coefficient estimates are not listed, but they are found to be jointly significant in all models.[3] Model (1c) is a price specification controlling for year effects. In the full sample, the EPS coefficient is now insignificant. However, the incremental value relevance of EPS is now 1.7 % and is significant at the 5 % level. Full R-squares increases slightly for both industry samples, as do the incremental value relevance of BVS. Nothing is changed with respect to significance for these two measures. Incremental value relevance of EPS, however, is now (2 %) and significant at the 5 % level in low-tech. All R-squared differences between the two industry groups are still insignificant. Return specification (2c) does yield interesting changes, though. Full R-squares experience dramatic raises in both samples from 7.4 % (low-tech) and 6.8 % (high-tech) to 37.2 % and 38.8 %, respectively. Both are now significant at the 1 % level. We see the same dramatic increase in the incremental R-squared of earnings as well. But perhaps most noticeably, the incremental value relevance of price-deflated change in earnings is now about 30 % for both groups and significantly so. Industry group differences are not significantly different. Apparently, the exclusion of year effects results in omitted variable bias.

[Table 2.5.2 about here]

2.5.2 Panel data methods

We are dealing with panel data, i.e. data with both a time and cross-sectional dimension. It is likely that there are firm specific effects present. Such an effect can be managerial ability, or as Amir and Lev (1996) suggest, financial risk associated with the company. Incorporating such time invariant effects into our specifications we get six new panel data models:

(1d) $P_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + a_i + u_{it}$

(2d) $R_{it} = \alpha + \beta_1 EARN_{it} + \beta_2 \Delta EARN_{it} + a_i + u_{it}$

(1e) $P_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \delta(LOSS_{it} * EPS_{it}) + a_i + u_{it}$

(2e) $R_{it} = \alpha + \beta_1 EARN_{it} + \beta_2 \Delta EARN_{it} + \delta(LOSS_{it} * EARN_{it}) + a_i + u_{it}$

(1f) $P_{it} = \alpha + \beta_1 BVS_{it} + \beta_2 EPS_{it} + \delta(LOSS_{it} * EPS_{it}) + \sum_{q=s}^{T-1} TD_{qt} + a_i + u_{it}$

(2f) $R_{it} = \alpha + \beta_1 EARN_{it} + \beta_2 \Delta EARN_{it} + \delta(LOSS_{it} * EARN_{it}) + \sum_{q=s}^{T-1} TD_{qt} + a_i + u_{it}$

where a_i is firm specific effects and u_{it} is the idiosyncratic error term. Two estimator candidates are random-effects (RE) and fixed-effects (FE). Intuitively we think that such firm specific effects are correlated with accounting variables. For example, a greater managerial ability would

[3] F-values to test the null hypothesis that all coefficients on year dummies are equal to zero are: 1) for the (1c) model = full sample (4.17), low-tech (4.50), high-tech (2.91); 2) for the (2c) model = full sample (62.80), low-tech (52.66), high-tech (21.00).

increase earnings, i.e. be positively correlated with earnings. Results from Hausman tests[4] support this intuition statistically even at the 1 % level for all specifications, and we will therefore use the FE estimator. Our OLS estimates are therefore inconsistent. Using FE estimation, time dummies in (1f) and (2f) are jointly significant at the 0.1 % level.

Regression results from FE estimations are found in table 2.5.3. We look first to the results from using the (1d) specification. In the full sample, the BVS coefficient is significant and full R-squared is significant and 16.8 %. The common explanatory power is also significant. Full R-squared is significant at the 1 % level in both industry groups. The difference between the two groups is not significant. Incremental R-squared due to BVS is only significant (at the 5 % level) for high-tech, and it is significantly greater than that in low-tech. The incremental R-squared of EPS is never significant. The common R-squared from both earnings and book values per share is significant only in low-tech, and is significantly greater in that industry group at the 5 % level compared to high-tech. The BVS coefficient is not significant in either industry sample, which is in contrast with the findings from OLS estimation, while the EPS coefficient is now greater and still significant in low-tech. The BVS coefficient is, however, quite larger in high-tech than low-tech. These are indications of that BVS is more important in high-tech and EPS is more important in low-tech. The return specification (2d) reveals highly significant earnings coefficient in both industries. The EARN coefficient is greater in high-tech than low-tech, but the difference is not significant at the 5 % level. Value relevance, as measured by full R-squared, is highly significant in both as well, as is the incremental value relevance of reported earnings which are estimated to 6-7 %. The common R-squared and the incremental R-squared from change in earnings are never significant. No R-squares are significantly different between low-tech and high-tech.

With respect to hypothesis one look to table 2.5.4. The only significant difference in R-squares between the two industry groups is found in specification (1a). Apparently the incremental value relevance of BVS is higher in high-tech than for low-tech when controlling for negative earnings. For the common R-squared of both BVS and EPS, we find the opposite: it is

[4] The Hausman test checks whether the difference in coefficients between the estimated FE model and the estimated RE model is systematic or not. The test has a null hypothesis under which RE is efficient, and an alternative hypothesis under which RE is inconsistent. The FE estimator is consistent under both hypotheses. The RE estimator assumes that the covariance between the firm-specific effects and the explanatory variables is zero. This assumption is therefore a suitable null hypothesis. Thus, our test setup is as follows:

H_0: $Cov(a_i, A) = 0$, H_A: $Cov(a_i, A)$!= 0, where a_i are firm specific effects, and A is a vector of our accounting variables.

Chi-squared test statistics (p-values in parentheses) by models in the full sample:

(1d)	76.15 (0.0000)
(1e)	95.89 (0.0000)
(1f)	37.00 (0.0000)
(2d)	9.55 (0.0085)
(2e)	34.98 (0.0000)
(2f)	120.96 (0.0000)

significantly greater in low-tech than in high-tech. While the latter may give so, the results all-in-all do not give sufficient support for hypothesis 1.

[Insert Table 2.5.3 about here]

Controlling for losses, BVS is no longer significant in the full sample. The EPS coefficient goes from being insignificant to significant at the 1 % level. This suggests that, overall, controlling for losses increases the importance of earnings per share. Full R-squares are still significant in both industry samples when using (1e). Neither incremental R-squares are significant, but the common R-squared is significant in both industry groups. Neither difference in R-squares is significant. Specification (2e) results indicate no difference in significance from what was reported from specification (2d) above. We notice the same pattern of changes in the coefficient estimates as with OLS in 2.5.1. The BVS and EPS coefficients decrease and increase, respectively, in both industry samples when controlling for negative earnings. Again, the new estimates are not significantly different from the old estimates at the 5 % level, but may be an indication of investors that put more value on earnings and less on book values when taking losses into account. The return model (2b) yields that changes in earnings are now significant in the full sample. It also shows increased earnings coefficients compared to using specification (2a). The new coefficient estimates are not significantly different from those of (2a), but may indicate a value-relevance shift nonetheless.

The statistics for testing the difference in R-squares when controlling for losses are found in table 2.5.4. No R-squared is significantly greater when controlling for losses, so we do not find any support for our second hypothesis. Also, as with OLS, controlling for losses does not alter our conclusion of hypothesis 1.

Controlling for year effects, the price specification shows a lowered full R-squared in the complete sample. The EPS coefficient is not significant anymore. Full R-squared is significant in the low-tech sample, but not in high-tech. However, incremental explanatory power from controlling for change in earnings is now significantly negative in low-tech industries. Also, common explanatory power of earnings and change in earnings are 24.1 % and 28.4 % in low-tech and high-tech industries, respectively. There are no significant differences in explanatory power in the model between the two industry groups. In the return specification (2f), EARN is now significant in the full sample, and all R-squares are significant at the 1 % level. The full explanatory power is 35 %. Incremental explanatory power for earnings is now significant at the

1 % level for both industry groups. In the low-tech industries it is 35.6 % while it is 39.8 % in high-tech.

[Table 2.5.4 about here]

2.5.3 Cross-sample comparison of R-squared

To deal with the problems associated with comparing R-squared between samples, we apply the abnormal pricing error approach as proposed by Gu (2007). The method for calculating mean average abnormal pricing errors (MAPEs) is explained in section 2.3.3.

Table 2.5.5 enlists the test for standalone MAPEs and the cross-industry differences in MAPEs. We see that none of the MAPEs are significantly different from zero. A MAPE close to zero means that there is *less* pricing error. Thus, that none of the MAPEs are significantly different from zero means that we cannot reject that abnormal pricing errors are on average non-existing. Differences in MAPEs between industry groups are tested in table 2.5.5. Earlier we found that none of the full R-squares were significantly different between the two industry groups. Consistent with that finding, the differences in MAPEs are also found to be insignificant at any decent level of significance. Thus, the MAPE approach does not alter our conclusion about hypothesis 1 when using OLS.

[Insert Table 2.5.5 about here]

Remembering hypothesis 2 we test the difference in MAPE for each sector sample when going from the basic price and return specifications (1a) and (2a) to controlling for losses in (1b) and (2b). The test results are listed in table 2.5.6. The MAPE differences indicate no significant decrease in pricing errors when controlling for losses at any decent level of significance, which is in line with the R-squared results we previously found.

[Insert Table 2.5.6 about here]

MAPE tests between industry groups using fixed-effects estimations are found in table 2.5.7. None of the MAPEs are significantly different from zero indicating no severe pricing errors on average, and none of the cross-industry MAPE differences are significant. Table 2.5.8 shows testing for change in MAPE when controlling for negative earnings. There are no significant differences.

[Insert Table 2.5.7 about here]

[Insert Table 2.5.8 about here]

The MAPE checks do not alter any of the conclusions we previously made.

2.6 Concluding remarks

We divide firms into two industry groups, namely high-tech and low-tech. We hypothesize that because of the extensive use of R&D expenditure accounting in high-tech industries, financial information is more value-relevant in low-tech industries, e.g. as found in Beisland (2008). Our second hypothesis, that financial accounts in both types of industries are more value-relevant when controlling for losses, stems from findings in previous studies (Hayn [1995], Basu [1997], Joos and Plesko [2005]).

In our basic approach in 2.5.1, we find no support for either hypothesis. The non-existing difference in the value-relevance between our two industry groups is contrary to our hypothesis, but it is in accordance with some previous research, e.g. Francis and Schipper (1999). An explanation may be that R&D investments on average are losses that should be expensed, or that investors perceive the investments as so risky that they would rather want the tax deduction on expenses now instead of capitalizing the assets. Our result of little improvement in the explanatory power when controlling for negative earnings is more surprising. This finding might be due to that a great portion of losses are associated with unrecognized assets, so that they are value relevant to begin with (Joos and Plesko [2005], Darrough and Ye [2007]).

We are left with the same conclusions even when using the fixed-effects estimator to control for time-invariant firm specific effects present in our panel. However, using both the OLS and fixed-effects approach, we find indications of shifts in the association between financial information and stock prices and returns by the regressor coefficients. These shifts indicate that while the overall value-relevance does not change, it might be that the value-relevance of individual items changes. These changes are not statistically significant. Finally, we consider the problems of cross-sample comparison of R-squared and scale effects, and estimate abnormal pricing errors as proposed in Gu (2007). These pricing errors do not alter any of the conclusions.

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	Full sample						Low-tech					
	P	R	EPS	BVS	EARN	ΔEARN	P	R	EPS	BVS	EARN	ΔEARN
Mean	55.818	0.104	7.207	82.022	0.180	0.132	59.014	0.113	8.768	96.809	0.219	0.141
Standard deviation	60.229	0.553	15.480	111.733	0.601	1.718	61.759	0.531	16.440	118.350	0.646	1.886
1st quartile	12.000	-0.256	-0.341	9.824	-0.021	-0.068	13.000	-0.225	-0.045	14.676	0.000	-0.076
Median	35.000	0.043	2.235	36.374	0.075	0.014	37.000	0.055	3.381	50.667	0.096	0.014
3rd quartile	77.590	0.345	10.354	106.915	0.246	0.121	86.030	0.332	12.975	127.320	0.293	0.131

	High-tech					
	P	R	EPS	BVS	EARN	ΔEARN
Mean	41.971	0.066	0.445	17.962	0.011	0.091
Standard deviation	50.920	0.640	7.139	29.098	0.289	0.632
1st quartile	9.950	-0.453	-1.581	3.679	-0.082	-0.044
Median	25.690	-0.027	0.041	8.563	0.004	0.015
3rd quartile	51.750	0.498	2.163	17.517	0.087	0.094

Table 2.4.1: Descriptive statistics for full sample and industry samples.

	Full sample						Low-tech					
	R	P	EARN	ΔEARN	BVS	EPS	R	P	EARN	ΔEARN	BVS	EPS
R		**0.135	**0.254	**0.089	*0.059	**0.159		**0.126	**0.264	**0.097	*0.057	**0.152
P	**0.223		0.007	-0.044	**0.479	**0.402	**0.208		-0.019	-0.044	**0.484	**0.416
EARN	**0.379	**0.255		**0.114	**0.323	**0.592	**0.374	**0.207		**0.102	**0.302	**0.587
ΔEARN	**0.299	-0.005	**0.403		-0.020	*0.054	**0.314	0.014	**0.420		-0.024	0.051
BVS	**0.160	**0.645	**0.508	0.016		**0.719	**0.157	**0.649	**0.482	0.037		**0.711
EPS	**0.304	**0.502	**0.869	**0.330	**0.666		**0.277	**0.521	**0.846	**0.343	**0.681	

	High-tech					
	R	P	EARN	ΔEARN	BVS	EPS
R		**0.166	**0.266	0.068	0.040	**0.262
P	**0.273		*0.119	-0.095	**0.530	*0.152
EARN	**0.421	**0.339		**0.450	**0.273	**0.465
ΔEARN	**0.258	-0.091	**0.406		-0.059	0.096
BVS	0.104	**0.680	**0.362	-0.073		**0.472
EPS	**0.463	**0.342	**0.883	**0.371	**0.376	

Pearson's product-moment correlations are above the diagonals. Spearman's rank correlations are below the diagonals.
** = significant at the 1 % level; * = significant at the 5 % level. Significance is tested based on Fisher's transformation and is two-sided.

Table 2.4.2: Correlations for full sample and industry samples.

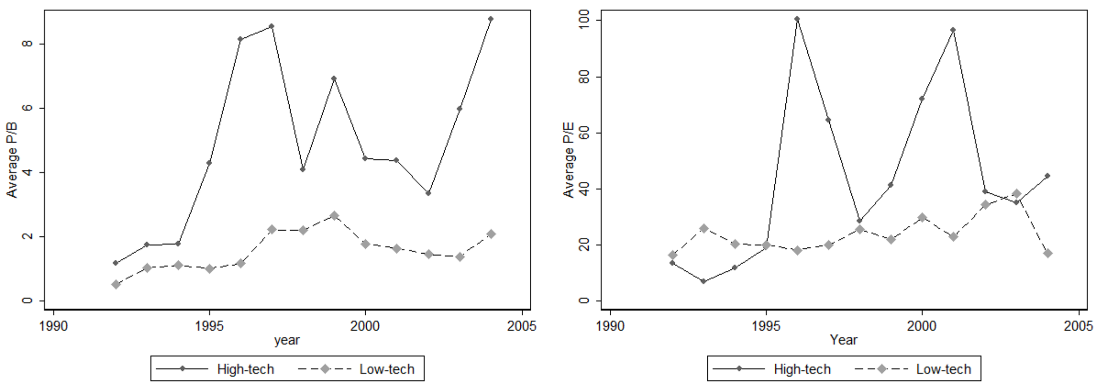

Figure 2.4.1: Average P/B and P/E by year and industry group.

	Price specfication (1a)				Price specification (1b)				Price specification (1c)			
	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.
Intercept	**35.062	**34.986	**23.854		**34.618	**35.469	**22.389		**41.176	**38.197	27.112	
	(25.46)	(22.32)	(8.45)		(23.75)	(21.31)	(7.12)		(5.21)	(4.92)	(0.90)	
BVS	**0.213	**0.199	**1.031		**0.205	**0.207	**0.863		**0.216	**0.221	**0.915	
	(10.12)	(9.88)	(6.58)		(8.07)	(8.28)	(5.18)		(8.33)	(8.56)	(5.23)	
EPS	**0.461	**0.540	-0.898		*0.544	*0.457	0.392		0.421	0.321	0.143	
	(2.82)	(3.41)	(-1.26)		(2.46)	(2.08)	(0.44)		(1.86)	(1.41)	(0.16)	
LOSS*EPS					-0.352	0.388	-2.301		-0.304	0.426	-1.886	
					(-0.68)	(0.89)	(-1.27)		(-0.60)	(0.99)	(-1.05)	
R^2_{full}	**0.236	**0.243	**0.288	-0.044	**0.235	**0.243	**0.296	-0.053	**0.246	**0.254	**0.312	-0.058
	(11.48)	(11.20)	(3.36)	(-0.50)	(11.50)	(11.26)	(3.35)	(-0.58)	(12.00)	(11.92)	(3.60)	(-0.65)
R^2_{BVS}	**0.075	**0.071	**0.268	*-0.197	**0.054	**0.061	*0.112	-0.050	**0.065	**0.072	*0.128	-0.055
	(6.14)	(5.65)	(3.30)	(-2.48)	(4.42)	(4.54)	(2.02)	(-0.88)	(4.89)	(4.73)	(2.24)	(-0.94)
R^2_{EPS}	0.006	0.010	0.010	0.000	0.006	0.009	0.018	-0.009	*0.017	*0.020	0.034	-0.014
	(1.25)	(1.56)	(0.43)	(-0.01)	(1.14)	(1.60)	(0.49)	(-0.23)	(2.27)	(2.52)	(0.71)	(-0.28)
R^2_{common}	**0.155	**0.162	0.010	**0.153	**0.175	**0.172	**0.166	0.006	**0.165	**0.162	*0.150	0.011
	(8.15)	(8.36)	(0.18)	(5.56)	(8.92)	(8.06)	(2.62)	(0.21)	(7.73)	(6.97)	(2.09)	(0.34)

	Return specification (2a)				Return specification (2b)				Return specification (2c)			
	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.
Intercept	**0.071	**0.077	0.067		**0.057	**0.056	0.053		-0.0162	**0.889	**0.635	
	(4.72)	(4.77)	(1.77)		(3.42)	(3.19)	(1.21)		(-0.52)	(9.83)	(3.06)	
EARN	**0.230	**0.212	**0.674		**0.256	**0.247	**0.778		**0.166	**0.165	0.436	
	(7.51)	(6.69)	(4.43)		(7.36)	(6.97)	(2.92)		(5.26)	(5.17)	(1.67)	
ΔEARN	0.020	0.020	-0.069		0.019	0.019	-0.083		0.002	0.002	-0.067	
	(1.30)	(1.26)	(-1.11)		(1.30)	(1.26)	(-1.17)		(0.14)	(0.13)	(-1.39)	
LOSS*EARN					-0.130	-0.189	-0.199		0.071	0.022	0.171	
					(-1.29)	(-1.75)	(-0.60)		(0.83)	(0.25)	(0.93)	
R^2_{full}	**0.065	**0.070	*0.070	0.000	**0.067	**0.074	*0.068	0.007	**0.354	**0.372	**0.388	-0.016
	(3.64)	(2.93)	(2.55)	(0.01)	(3.73)	(3.17)	(2.15)	(0.17)	(15.95)	(14.20)	(8.75)	(-0.31)
R^2_{EARN}	**0.058	**0.062	**0.069	-0.007	**0.059	**0.066	*0.067	-0.001	**0.347	**0.363	**0.387	-0.024
	(3.33)	(2.88)	(2.58)	(-0.21)	(3.35)	(3.02)	(2.20)	(-0.03)	(13.03)	(11.06)	(8.63)	(-0.43)
$R^2_{\Delta EARN}$	0.002	0.001	0.002	-0.001	0.002	0.002	0.004	-0.002	**0.289	**0.299	**0.324	-0.024
	(0.16)	(0.08)	(0.30)	(-0.06)	(0.17)	(0.12)	(0.35)	(-0.09)	(12.71)	(10.98)	(6.76)	(-0.44)
R^2_{common}	0.006	0.007	-0.002	0.009	0.005	0.007	-0.003	0.009	**-0.282	**-0.291	**-0.323	0.032
	(0.44)	(0.46)	(-0.10)	(0.39)	(0.42)	(0.40)	(-0.16)	(0.39)	(-10.00)	(-8.26)	(-6.36)	(0.64)

T-statistics in parantheses. Hetereskedasticity robust standard errors are used. R-squared standard errors are estimated using bootstrapping with 10,000 repetitions.
* p < 0.05; ** p < 0.01 for the two-sided test with the null that the coefficient, R-squared or the R-squared difference in question is equal to zero.

Table 2.5.1: Estimation results using OLS on specifications 1a, 1b, 1c, 2a, 2b and 2c.

	Full sample			Low-tech			High-tech		
	Diff.	Std.dev.	T-statistic	Diff.	Std.dev.	T-statistic	Diff.	Std.dev.	T-statistic
Price specification									
R^2_{full}	0.000	0.029	-0.005	0.000	0.031	-0.006	0.008	0.123	0.067
R^2_{BVS}	-0.021	0.017	-1.192	-0.010	0.019	-0.541	-0.156	0.098	-1.591
R^2_{EPS}	0.000	0.007	-0.020	0.000	0.009	-0.023	0.008	0.043	0.192
R^2_{common}	0.021	0.027	0.753	0.010	0.029	0.347	0.156	0.084	1.861
Return specification									
R^2_{full}	0.001	0.025	0.051	0.004	0.034	0.121	-0.002	0.042	-0.052
R^2_{EARN}	0.001	0.025	0.052	0.004	0.031	0.133	-0.002	0.040	-0.054
$R^2_{\Delta EARN}$	0.000	0.015	0.003	0.001	0.023	0.023	0.001	0.013	0.085
R^2_{common}	0.000	0.018	-0.002	-0.001	0.023	-0.023	-0.001	0.022	-0.050

Table 2.5.2: T tests for increase R-squares by controlling for losses using OLS bootstrapping results.

	Price specification (1d)				Price specification (1e)				Price specification (1f)			
	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.
Intercept	**51.534	**54.448	**28.240		**52.338	**55.917	25.396		**40.977	**20.391	**51.869	
	(25.80)	(23.22)	(2.72)		(25.24)	(-24.49)	(2.19)		(7.72)	(3.20)	(3.90)	
BVS	**0.553	-0.007	0.768		0.016	**0.014	0.656		0.029	0.029	0.491	
	(4.16)	(-0.27)	(1.32)		(0.59)	(0.53)	(1.17)		(1.06)	(1.07)	(1.35)	
EPS	0.004	**0.598	-0.161		**0.411	*0.357	1.259		0.204	0.146	1.316	
	(0.14)	(4.56)	(-0.19)		(2.73)	(2.43)	(1.42)		(1.59)	(1.15)	(1.25)	
LOSS*EPS					0.593	*1.100	-2.489		0.714	**1.157	-1.658	
					(1.06)	(2.45)	(-1.14)		(1.36)	2.61	(-0.76)	
R^2_{full}	**0.168	**0.158	**0.285	-0.127	**0.156	**0.141	**0.295	-0.153	*0.092	**0.105	0.186	-0.080
	(3.29)	(2.82)	(2.66)	(-1.05)	(3.00)	(2.62)	(2.62)	(-1.23)	(2.48)	(2.64)	(1.37)	(-0.57)
R^2_{BVS}	0.007	-0.014	*0.262	*-0.277	0.030	0.029	0.105	-0.076	-0.035	-0.007	-0.004	-0.003
	(0.14)	(-0.27)	(2.53)	(-2.37)	(0.64)	(0.58)	(1.16)	(-0.73)	(-0.77)	(-0.15)	(-0.03)	(-0.02)
R^2_{EPS}	-0.061	-0.076	0.005	-0.081	-0.073	-0.093	0.014	-0.107	**-0.138	**-0.129	-0.095	-0.034
	(-1.29)	(-1.43)	(0.08)	(-0.99)	(-1.50)	(-1.82)	(0.20)	(-1.22)	(-3.77)	(-3.17)	(-0.75)	(-0.26)
R^2_{common}	**0.223	**0.249	0.018	*0.231	**0.200	**0.205	*0.175	0.030	**0.264	**0.241	*0.284	-0.043
	(4.26)	(4.38)	(0.23)	(2.37)	(4.14)	(3.94)	(2.16)	(0.31)	(5.35)	(4.74)	(2.16)	(-0.30)
	Return specification (2d)				**Return specification (2e)**				**Return specification (2f)**			
	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.	Full sample	Low-tech	High-tech	Diff. R-sq.
Intercept	**0.055	**0.058	**0.069		-0.006	-0.014	0.034		-0.058	**0.783	0.326	
	(6.10)	(5.06)	(13.65)		(-0.30)	(-0.59)	(0.88)		(-1.36)	(8.31)	(1.22)	
EARN	**0.313	**0.294	**0.762		**0.451	**0.441	*0.994		**0.284	**0.289	0.252	
	(6.90)	(6.22)	(2.99)		(6.62)	(6.30)	(2.14)		(4.86)	(4.73)	(0.59)	
ΔEARN	0.023	0.023	-0.096		**0.025	**0.025	-0.117		0.006	0.006	-0.023	
	(1.88)	(1.81)	(-1.44)		(2.63)	(2.59)	(-1.38)		(0.59)	(0.61)	(-0.26)	
LOSS*EARN					**-0.492	**-0.540	-0.468		-0.157	-0.210	0.382	
					(-3.56)	(-3.66)	(-0.83)		(-1.36)	(-1.72)	(0.84)	
R^2_{full}	**0.067	**0.072	**0.077	-0.005	**0.065	**0.074	**0.076	-0.002	**0.350	**0.365	**0.398	-0.032
	(3.82)	(3.15)	(2.79)	(-0.13)	(3.96)	(3.58)	(2.79)	(-0.07)	(14.83)	(13.05)	(7.64)	(-0.54)
R^2_{EARN}	**0.059	**0.062	**0.072	-0.010	**0.057	**0.065	**0.072	-0.007	**0.342	**0.356	**0.393	-0.037
	(3.24)	(2.73)	(2.67)	(-0.27)	(2.93)	(2.56)	(2.67)	(-0.18)	(12.96)	(10.99)	(7.52)	(-0.60)
$R^2_{\Delta EARN}$	0.002	0.002	0.006	-0.004	0.002	0.002	0.009	-0.006	**0.286	**0.294	0.330	-0.036
	(0.23)	(0.13)	(0.53)	(-0.20)	(0.22)	(0.20)	(0.58)	(-0.34)	(11.99)	(10.18)	(5.99)	(-0.66)
R^2_{common}	0.006	0.007	-0.001	0.008	0.006	0.007	-0.004	0.011	**-0.279	**-0.284	-0.325	0.041
	(0.41)	(0.42)	(-0.07)	(0.35)	(0.40)	(0.34)	(-0.20)	(0.38)	(-10.03)	(-8.19)	(-5.65)	(-0.20)

T-statistics in parantheses. Hetereskedasticity robust standard errors are used. R-squared standard errors are estimated using bootstrapping with 10,000 repetitions.
* $p < 0.05$; ** $p < 0.01$ for the two-sided test with the null that the coefficient, R-squared or the R-squared difference in question is equal to zero.

Table 2.5.3: Estimation results using FE on specifications 1a, 1b, 1c, 2a, 2b and 2c.

	Full sample			Low-tech			High-tech		
	Diff.	Std.dev.	T-statistic	Diff.	Std.dev.	T-statistic	Diff.	Std.dev.	T-statistic
Price specification									
R^2_{full}	-0.017	0.073	-0.234	-0.017	0.078	-0.219	0.009	0.155	0.059
R^2_{BVS}	0.044	0.068	0.639	0.044	0.073	0.593	-0.157	0.138	-1.141
R^2_{EPS}	-0.017	0.069	-0.249	-0.017	0.074	-0.231	0.009	0.095	0.097
R^2_{common}	-0.044	0.071	-0.612	-0.044	0.077	-0.565	0.157	0.113	1.389
Return specification									
R^2_{full}	-0.002	0.024	-0.068	0.002	0.031	0.073	0.000	0.042	-0.001
R^2_{EARN}	-0.002	0.027	-0.061	0.002	0.034	0.066	0.000	0.040	-0.001
$R^2_{\Delta EARN}$	-0.001	0.012	-0.045	0.000	0.019	0.011	0.003	0.018	0.160
R^2_{common}	0.001	0.021	0.027	0.000	0.028	-0.007	-0.003	0.026	-0.112

Table 2.5.4: T tests for increase R-squares by controlling for losses using FE bootstrapping results.

	Low-tech		High-tech		Difference	
	MAPE	T stat.	MAPE	T stat.	Diff.	T stat.
1a	0.713	0.665	0.190	0.110	0.523	0.257
1b	0.784	0.402	0.431	0.247	0.354	0.173
1c	0.375	0.363	-0.297	-0.190	0.672	0.359
2a	0.005	0.432	0.004	0.170	0.001	0.044
2b	0.005	0.455	0.004	0.170	0.001	0.052
2c	0.004	0.415	0.002	0.120	0.009	0.057

MAPE = Mean Abnormal Pricing Error.
T statistics are for the test with the null hypothesis of the mean or mean difference being equal to zero.

Table 2.5.5: T tests for differences in mean absolute pricing errors using OLS estimation.

	Low-tech		High-tech	
	MAPE diff.	T stat.	MAPE diff.	T stat.
1a vs 1b	-0.071	-0.047	-0.240	-0.098
2a vs 2b	0.000	-0.013	0.000	0.000

MAPE diff. = Difference in Mean Abnormal Pricing Error using the respective sample on the two different specifications
T statistics are for the test with the null hypothesis that the MAPE difference is equal to zero.

Table 2.5.6: T tests for differences in MAPE fit when using OLS estimation.

	Low-tech		High-tech		Difference	
	MAPE	T stat.	MAPE	T stat.	Diff.	T stat.
1a	0.113	0.160	0.182	0.128	0.069	0.044
1b	0.375	0.531	0.306	0.227	-0.068	-0.045
1c	-0.016	-0.025	0.653	0.543	0.668	0.493
2a	0.002	0.237	0.000	0.009	-0.002	-0.094
2b	0.002	0.197	0.000	-0.006	-0.002	-0.088
2c	-0.001	-0.110	-0.004	-0.231	-0.003	-0.165

MAPE = Mean Abnormal Pricing Error.
T statistics are for the test with the null hypothesis of the mean or mean difference being equal to zero.

Table 2.5.7: T tests for differences in mean absolute pricing errors using FE estimation.

	Low-tech		High-tech	
	MAPE diff.	T stat.	MAPE diff.	T stat.
1a vs 1b	-0.2619275	-0.2629	-0.1244558	-0.0635
2a vs 2b	0.0004566	0.0327	3.19E-04	0.0108

MAPE diff. = Difference in Mean Abnormal Pricing Error using the respective sample on the two different specifications
T statistics are for the test with the null hypothesis that the MAPE difference is equal to zero.

Table 2.5.8: T tests for differences in MAPE fit when using FE estimation.

Chapter 3: Essay 2

The Financial Crisis' Impact on the Value Relevance of Financial Information

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Abstract

The financial crisis of the late 2000s is an opportunity for a shock analysis on the value relevance of financial information. We look to companies listed on Oslo Stock Exchange and define two periods in relation to the financial crisis: one before the crisis, and one during it. We then check whether there is a difference in the value-relevance of accounting information during the crisis compared to before. Our results show that the value relevance of reported net income increases during the crisis which is only consistent with the minority of crisis research. We believe our finding is due to implied unrecognized net assets in the income statement. Further, we decompose earnings into cash flows and accruals. We hypothesize that because impairments occur more frequently during times of crisis, that accruals will be increasingly value relevant. We find evidence in support of this hypothesis. The total value relevance of book equity and the income statement increases during the crisis. All our findings are maintained during robustness tests.

3.1 Introduction

In this essay we look at firms listed on Oslo Stock Exchange to study whether the late 2000s financial crisis affected the value relevance of financial information. We look at the years 2005-2008 and divide the sample into two subsamples: one before the crisis and one during the crisis.

The majority of previous value relevance literature on financial crises and firms' financial health suggests that the value relevance of the income statement and the value relevance of the balance sheet move inversely (Barth et al. [1998], Graham et al. [2000], Collins et al. [1997]) and that the balance sheet becomes more important during financial distress (Barth et al. [1998]). These findings indicate that the balance sheet should have become more value relevant during the financial crisis, and, conversely, the income statement should have become less important.

We do cross-sectional regressions with four nested specifications. All specifications are based on explaining market value of equity from accounting information and control variables. We start with explaining market value of equity with book equity and earnings (reported net income). Our analyses show that the value relevance of earnings increases during the crisis and that we cannot conclude that book values have become less value relevant. We interpret the finding as that the liquidation effect does not dominate the unrecognized net assets effect (Barth et al. [1998]; see also section 3.2). Then we decompose earnings into a cash flow and an accruals item, and find that accruals are significantly more value relevant during the crisis. We believe this effect can be attributed to that the number of impairments and their magnitudes increase during times of crisis. In both specifications, the total value relevance, given by R-squared, increases. The latter finding is robust to Gu (2007)'s residual based method to cope with the problems cross-sample comparison of R-squares. We continue to extend both our base specifications by controlling for negative earnings and cash flows, firm size and industry valuation effects. Our early findings are kept intact in all specifications. Firm size, as a function of total assets, also seems to carry value relevant information.

The remainder of this paper is structured as following. In section 3.2 we go through previous research done on the value relevance of accounting information and the implications of financial crises. Section 3.3 explains our method. Next, we describe our data in section 3.4. Our analyses are done in section 3.5. Finally, we summarize and conclude in section 3.6.

3.2 Value Relevance & the Crisis

3.2.1 Literature

The meaning of "value relevance" is discussed in Fancis and Schipper (1999). We define value relevance as the ability of financial accounts to hold information that investors use to value company equity.

Value relevance research often focuses on the balance sheet, summarized by book value of equity, and the income statement, summarized by earnings (net income). The distinction of book values and income items in financial reports assumes that the two parts convey different information. Barth et al. (1998) distinguish between roles of the two parts: the income statement's primary role is to provide information for valuing equity, and it does so by providing information about income and costs on the firm's operations. The role of the balance sheet is to assist in loan processing and monitoring of debt contracts. The balance sheet does this by providing information about the liquidation values of assets. This is the value that creditors have access to in case the firm defaults. That both the income statement and balance sheet are value relevant is evident from previous studies (e.g., Easton and Harris [1991], Collins et al. [1997], Deschow et al. [1999], Fancis and Schipper [1999]).

Some studies also focus on the value relevance of cash flow measures and accruals. Bowen et al. (1987) find that cash flows contain significant incremental information after controlling for earnings. They also find evidence for that accrual accounting data has incremental explanatory power beyond that contained in cash flow measures. Wilson (1987) investigates whether there is incremental information in funds and accrual components of earnings beyond that in earnings itself. Wilson finds that they do provide such additional information if funds are cash flow from operations. Bernard and Stober (1989) reject the findings in Wilson (1987). They suggest that the pricing of such funds and accruals information may be too contextual to be modeled by a relatively simple regression model, and also that uncertainty about the contents of financial statements are resolved prior to their public release. Sloan (1996) explores whether the accrual and cash flow components that carry information about future earnings are priced into the market prices of shares, i.e. whether stock prices reflect this information. Sloan finds that the cash flow component is more reflected in stock prices than the accruals component. Pfeiffer and Elgers (1999) find no significant difference in the valuation of accruals versus cash flows when assessing the relationship between contemporaneous stock returns and current earnings components.

Studies also show that the value relevance of accounting information varies with different factors. One such factor is losses. Hayn (1995) studies the information content of negative earnings and finds that they are less informative than positive earnings. Hayn suggests that this is due to that investors can sell their shares if the losses are not perceived as transitory, i.e. that investors have a liquidation option. There are also other studies that confirm this empirically (e.g., Basu [1997] and Joos and Plesko [2005]).

Another factor is non-recurring items of earnings. Elliott and Hanna (1996) examine the value relevance of earnings in the presence of large non-recurring charges. Elliott and Hanna find that transitory items in earnings are less value relevant than recurring items. Their finding is consistent with the notion that non-recurring items in earnings having less value relevant information than the recurring component of earnings.

Another factor is industry valuation effects. Industry membership groups companies such that they are sorted according to a selection of economic and financial characteristics, e.g. financial and operation leverage, product type and industry barriers (Biddle and Seow [1991]). Biddle and Seow show that the earnings response coefficients differ across industries. Francis and Schipper (1999) are not able to conclude that financial information is more value relevant in low-tech industries compared to high-tech industries. Using Swedish market data, Beisland and Hamberg (2008) find that accounting information is less value relevant for high-tech firms than other firms.

3.2.2 The Crisis and Its Implications for Value Relevance

The financial crisis of the late 2000s left many countries in an economic recession. Investors in worldwide capital markets suffered severely. Equity prices fell dramatically, as demonstrated by that both the S&P 500 and MSCI World Index nearly halved their index values from fall 2008 to early 2009. This leaves us with an opportunity to do a shock-analysis to evaluate the crisis' effect on the value relevance of accounting information.

The balance sheet and income statement fulfill different roles: the balance sheet primarily provides information for issuing and monitoring debt contracts, whereas the income statement helps investors in valuing equity. The two roles are not mutually exclusive, however, because the probability of default and the liquidation values also affect equity values (Barth et al. [1998]). Barth et al. suggest that earnings, represented by net income, convey information about unrecognized net assets such as R&D and technological advantage, but earnings do so with error. This error leads to the book value of equity reflecting both liquidation value *and* the portion of unrecognized net assets that is not conveyed in earnings. Yet, because of the two part's distinctive roles, Barth et al. predict that as the financial health of a company decreases, the balance sheet's importance increases while the income statement's importance decreases for equity valuation. The intuition is that as a company enters financial distress its net assets decrease in value. However, as we noted above, book values of equity may convey some information about unrecognized net assets. The argument is then that as long as the liquidation value effect dominates the unrecognized net assets valuation effect, the value relevance of equity book value will increase with weakened financial health. Barth et al.'s findings are consistent with their prediction. Their findings are line with previous research that suggests that the value relevance of book values and earnings move inversely to each other (e.g., Collins et al. [1997]).

Graham et al. (2000) study the value relevance effects of the 1997 crisis in Thailand during which the decline in the value of the baht was severe. They find that the crisis led to a decrease in the value relevance of accounting information, and that the decline can be attributed to the decreased value relevance of earnings. Graham et al. suggest that the decline in earnings' value relevance is due to 1) the baht devaluation leading to uncertainty regarding future cash flows, and/or 2) prevalence of losses during and after the crisis. The latter argument is related to Hayn (1995) who argues that losses are less value relevant than positive earnings because of the liquidation option held by equity owners.

Davis-Friday and Gordon (2005) studies whether the Mexico currency crisis in 1994 has had any effect on the value relevance of earnings, book values, cash flows and earnings accruals. They find that the coefficient on and incremental explanatory power of earnings do not decline when controlling for negative earnings, and that the incremental explanatory power of equity book values increases during the crisis period but that the coefficient on book values does not change significantly. Davis-Friday and Gordon find that when controlling for negative earnings, earnings remain significant during the crisis, and that the book equity's value relevance does not increase. These findings are not consistent with those of Barth et al. (1998), Graham et al. (2000) and Collins et al. (1997). Davis-Friday and Gordon (2005) also find that the value relevance of cash flows from operations is increased during and after the crisis.

On the basis of the above discussion in section 3.2, we formulate several research questions and hypotheses.

Research Question 1 (RQ1): What impact has the financial crisis had the value relevance of equity book value and earnings?

Research Question 2 (RQ2): How has the financial crisis affected the valuation of operating cash flows and earnings accruals?

With respect RQ1, we note that great portion of the financial distress research indicates that book values become more value relevant, and earnings less value relevant, when companies are led into financially hard times (Barth et al. [1998], Graham et al. [2000] and Collins et al. [1997]). Thus, we make the following hypotheses to RQ1:

Hypothesis 1 (H1): Book equity becomes more value relevant during the crisis.
Hypothesis 2 (H2): Earnings become less value relevant during the crisis.

We now look at RQ2. We already predicted that the value relevance of earnings to decline, so we assume that the same argument can be used on the funds component of earnings, i.e. on cash flows from operations.

Hypothesis 3 (H3): Cash flows from operations are less value relevant during the crisis.

Davis-Friday and Gordon (2005) argue that accrual items remain value-relevant during a crisis. Elliott and Hanna (1996) find that non-recurring items in earnings are less value relevant than recurring items. There is, however, an important distinction to be made: the choice of observation period. The major difference between, e.g., the observation period in Elliott and Hanna (1996) and in the analysis we are conducting, is that we are doing a shock-analysis. The economic environment in which firms operate and investors value firms is dramatically changed during times of crises. One noteworthy implication is that fixed assets lose value more rapidly. Thus, impairments are more likely to occur, and the magnitude of impairments is likely to be greater. Impairments are embedded in the accruals components of earnings. As negative accruals increase from impairments, accruals constitute a greater portion of earnings, and are as such increasingly more important to take into account when valuing equity. Thus, we also hypothesize to RQ2 that:

Hypothesis 4 (H4): Accruals are more value relevant during the crisis.

3.3 Method

To evaluate accounting information's value relevance we apply traditional regression analysis. We use econometric models in which market value of equity is a function of accounting data and additional control variables. The approach is based on Ohlson (1995), and is widely used in accounting research (e.g., Collins et al. [1997], Franchis and Schipper [1999]). Our basic model is then

(1a) $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \varepsilon_{it}$

where *P* is market value of equity per share, *BVS* is equity book value per share, *EPS* is earnings per share and ε is an error term. All variables are denoted for company *i* in period *t*. Earnings are given by reported net income. α_1 and α_2 are the valuation coefficients for book equity and earnings, respectively. To investigate whether the financial crisis had an impact on the valuation coefficients, we divide our sample into two parts: 1) before the crisis, and 2) during the crisis. Regressing model (1a) on both samples provides us the valuation coefficient estimates for the two periods and their respective standard errors. This is sufficient to determine whether the valuation coefficients are different in size and to assess whether they are significantly different in the statistical meaning. Say $\alpha_i^{c=0}$ is the valuation coefficient for variable *i* before the crisis (*c = 0*), and that $\alpha_i^{c=1}$is the valuation coefficient for the same accounting variable during the crisis (*c = 1*). Then if $|\alpha_i^{c=1} - \alpha_i^{c=0}| > 0$ the valuation of accounting variable *i* is different during the two periods. To check whether the difference is statistically significantly different from zero we compute the T-statistic $\frac{\hat{\alpha}_i^{c=1} - \hat{\alpha}_i^{c=0}}{se(\hat{\alpha}_i^{c=1} - \hat{\alpha}_i^{c=0})}$ and compare it to critical T-values. This difference and its T-statistic are directly obtained from an interaction model. For (1a) the interaction model is $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \omega_0 CRISIS_t + \omega_1[CRISIS_t * BVS_{it}] + \omega_2[CRISIS_t * EPS_{it}] + \varepsilon_{it}$, where *CRISIS* is a dummy set to 1 if the observation is during the crisis, and zero otherwise. Thus, we obtain the difference on the valuation coefficients from ω_i (for *i > 0)*, i.e. the interaction coefficients. If $\hat{\omega}_i > 0$, then the valuation coefficient for variable *i* is greater during the crisis than before the crisis. The T-statistic on the interaction coefficient is also the test statistic for the difference in coefficients between during the crisis and before it. This gives us what we need to conclude on hypothesis H1 and H2. H1 is confirmed if $\alpha_1^{c=1} - \alpha_1^{c=0} > 0$. H2 is confirmed if $\alpha_2^{c=0} - \alpha_2^{c=1} > 0$.

We also look at the valuation of earnings components and decompose earnings into two, namely a funds and an accrual component. As our funds component we will use cash flows from operations, see e.g. Davis-Friday and Gordon (2005). Then our model is

(2a) $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + u_{it}$

where *CFO* is reported net cash flows from operations per share, and *ACCR* is accruals per share. We define accruals as the difference between reported earnings and reported cash flow from operations, i.e. $ACCR_{it} = (EARN_{it} - CFO_{it})$. γ_1, γ_2 and γ_3 are then the valuation coefficients for book equity, cash flows and accruals, respectively. The statistical inference is done as with specification (1a).[5] H1 is confirmed if $\gamma_1^{c=1} - \gamma_1^{c=0} > 0$, H3 if $\gamma_2^{c=0} - \gamma_2^{c=1} > 0$, and H4 if $\gamma_3^{c=1} - \gamma_3^{c=0} > 0$.

Hayn (1995) shows that negative earnings are less value relevant than positive earnings. We would like to control for this non-linearity, and extend our specification by including an interaction term. Our model is then given by

$$(1b)\ P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS]_{it} + \varepsilon_{it}$$

where *LOSS* is a dummy set to 1 if company *i* has negative reported earnings, i.e. that *EPS < 0*, else it is set to zero. We expect $\hat{\alpha}_3$ to be negative. We denote the parameters and the error term as before for convenience and ease. Applying the same chain of thought to cash flows, we control for negative cash flows by extending (2a) to

$$(2b)\ P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO_{it}] + u_{it}$$

where *NEG* is a dummy set to 1 if *CFO < 0*, else it is zero. We also expect $\hat{\gamma}_4$ to be negative. The crisis' impact on valuation coefficients is found by interaction models.[6]

Barth et al. (1998) suggest that controlling for company size may be appropriate as a proxy for risk and other economic factors such as earnings persistence, accounting practices and financial health. We try to capture firm size heterogeneity by controlling for a size related intercept, but we do not let firm size interact with the accounting variables. Thus, specifications (1b) and (2b) are added on and become

$$(1c)\ P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS]_{it} + \alpha_4 LARGE_{it} + \varepsilon_{it}$$

$$(2c)\ P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO]_{it} + \gamma_5 LARGE_{it} + u_{it}$$

where *LARGE* is a dummy set to 1 if the company year observation has total assets greater than the sample median (Barth et al. [1998]). Corresponding changes are made to our interaction models.

Finally, we include industry dummies to control for industry valuation effects (Biddle and Seow [1991]). Firms are grouped according to the two first digits of their Global Industry Classification Standard (GICS) number. Bhojraj et al. (2003) compares industry classification schemes and find that GICS does a significantly better job at explaining cross-sectional variations in forecasted and realized growth rates, valuation multiples, R&D expenditures and several financial ratios. Our model specifications then become

[5] The interaction model is now: $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVSit] + \omega 2[CRISISt * CFOit] + \omega 3[CRISISt * ACCRit] + uit$

[6] For (1b) the interaction model is: $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS_{it}] + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVS_{it}] + \omega_2 [CRISIS_t * EPS_{it}] + \omega_3 [CRISIS_t * LOSS_{it} * EPS_{it}] + \varepsilon_{it}$.

For (2b) it is: $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO_{it}] + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVSit + \omega 2CRISISt * CFOit + \omega 3CRISISt * ACCRit + \omega 4[CRISISt * NEGit * CFOit] + uit$

(1d) $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS]_{it} + \alpha_4 LARGE_{it} + \sum_j^{N-1} \delta_j IND_{ij} + \varepsilon_{it}$

(2d) $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO]_{it} + \gamma_5 LARGE_{it} + \sum_j^{N-1} \delta_j IND_{ij} + u_{it}$

where IND_{ij} is an industry dummy set to 1 if company *i* operates in industry *j,* else it is zero. Thus, we try to capture systematic industry valuation noise and allow for industry specific intercepts in our models.

R-squared also gives us a measure of value relevance. We use adjusted R-squared as our measure of explanatory power. During the remainder of this paper we will refer to adjusted R-squared as only R-squared. To evaluate a variable's incremental explanatory power, we use the method applied in Collins et al. (1997). To exemplify, consider the regression model $y = \alpha + \sum_{i=0}^{N} \beta_i x_i + \varepsilon$. Denote the R-squared from regression *y* on all *N* explanatory variables as R^2_{full} and R-squared from regressing *y* on x_i as R^2_i. The incremental value relevance of accounting variable x_i, $R^2_{x_i}$, is then given by $R^2_{x_i} = R^2_{full} - \sum_{j=0}^{N} R^2_{j \neq i}$. The value relevance common to all *N* explanatory variables is then calculated as $R^2_{common} = R^2_{full} - \sum_{i=0}^{N} R^2_{x_i}$. Full R-squared may be used as a metric for total value relevance. We are therefore interested in the difference in full R-squares between our two samples. We will use the Cramer (1987) standard deviation to calculate a Z-statistic for the difference between R-squares.

Gu (2007) discusses the fallacy of cross-sample comparison of R-squares. For example, Gu points out, one common mistake is to infer change in the underlying economic situation from a change in R-squared that could merely be due to difference in an explanatory variable's variability between the samples. Thus, we might be at fault when claiming something about the change in total value relevance from a difference in R-squares. To cope with the problem, Gu proposes to look at the residuals and their dispersion because the variation in residuals is an economic parameter. One of the proposed methods is standardizing pricing errors by dividing each residual by the absolute value of that observation's predicted value. We can then test whether pricing errors are on average less during the crisis compared to before. Less pricing errors is equivalent to greater value relevance. Say the residual for company *i* in year *t* is given by ε_{it}, then the standardized pricing error, SPE, for that observation is given by $SPE_{it} = |\varepsilon_{it}|/|\hat{y}_{it}|$. Further, we denote the average standardized pricing error before the crisis as $\overline{SPE}^{c=0}$ and that during the crisis as $\overline{SPE}^{c=1}$. A two sample mean difference T-test will then help us in assessing whether there is less or more pricing error during the crisis compared to before. The T statistic is given by $\frac{(\overline{SPE}^{c=1} - \overline{SPE}^{c=0})}{se(\overline{SPE}^{c=1} - \overline{SPE}^{c=0})}$.

3.4 Data

We look at firms listed on Oslo Stock Exchange during the period 2005-2008. We consider years 2005 and 2006 as "before crisis" years, and years 2007 and 2008 as "during crisis" years. Our crisis period is consistent with Brunnermeier (2009) and U.S. Senate (2011). The U.S. Senate (2011) subcommittee on the financial crisis discusses many different times that one could argue defines the start of the crisis. It notes, however, that July 2007 is "the most immediate trigger to the financial crisis". That month's decision by Moody's and S&P to downgrade a great number of residential mortgage backed securities (RMBS) and collateralized debt obligations (CDO) was a defining moment because the downgrade made market participants realize that those securities were not safe investments and that they were going to incur losses. During 2009, equity prices rose rapidly which means that while many economies were in recession, investors' expectations for future cash flows rose. Therefore, we do not consider 2009 as a crisis year in the capital markets. We remove observations with variable values at or above their respective sample 99^{th} percentiles, or at or below their 1^{st} percentile. We also do a standardized residual cleaning by removing observations whose standardized residuals in absolute values are 3 or greater, by regressing the interaction models of specifications (1a) and (2a). We are left with 660 firm year observations in total; 303 of which are before the crisis and 357 are during.

Table 3.4.1 enlists summary statistics for the pooled sample and subsamples. Overall, the standard deviation of prices is about 25 % above its mean. Before the crisis this number is 10 %, and during the crisis it is 40 %, illustrating a bump in the cross-sectional price volatility during 2007 and 2008. The same development is made in EPS. Before the crisis, the sample standard deviation of EPS is roughly twice its mean. During the crisis, however, the same ratio is almost four. Overall, standard deviation of EPS is thrice its mean. Notice the negative 1^{st} quartile value for EPS during the crisis. 37 % of the firm year observations report negative earnings during 2007 and 2008. The book equity statistics differ from those of prices and earnings per share. There is no great difference in the variance of book equity between the two sub periods. CFO's ratio of standard deviation to its mean remains roughly the same between the samples while accruals show a significant change in variability from before the crisis compared to during the crisis. This tells us that it is the accruals component that causes the increased variability in earnings during the crisis, and not the funds component. In absolute value, the accruals mean is greater during the crisis, so the gap between earnings and cash flows from operations is increased during 2007 and 2008.

[Table 3.4.1 about here]

Pearson correlations are listed in Table 3.4.2. In the complete sample, all correlations are significant. Most correlations are positive, except for with accruals which correlate negatively with equity market price, book equity and cash flows. Comparing the correlations before vs. during the crisis, we see that the correlation between market values of equity and BVS, EPS and CFO increase during the crisis. Before the crisis, accruals do not correlate significantly with book equity. During the crisis, they do, but they are then no longer significantly correlated with market values of equity. The correlation between BVS and EPS falls slightly, while the correlation between BVS and CFO increases moderately. The co-variability between cash flows and earnings and between cash flows and accruals both drop somewhat in absolute value. At the same time, the correlation between accruals and earnings over doubles during the crisis, while that between accruals and earnings increases slightly.

[Table 3.4.2 about here]

Figure 3.4.1 shows plots of average earnings-to-price (E/P) ratios and average book-to-price (B/P) ratios over the observation years. The average E/P slightly declines from 2005 to 2007. The major decline in earnings during 2008 is demonstrated by the massive dip in the average E/P ratio that same year where it plunges down to -0.3. The average B/P ratio also shows a slight decline in the first three years in the observation period. During those years it lies just above 0.5. During 2008 it raises to over 1.5, which demonstrates how equity prices fell more rapidly than book values during that crisis year.

[Figure 3.4.1 about here]

3.5 Empirical Analyses

3.5.1 Regression Analyses

We start by regressing specifications (1a) and (2a). The results are enlisted in Table 3.5.1. Results of (1a) are found in panel A, whereas (2a) results are in panel B. Looking to panel A, we find that during the complete period both the EPS and BVS valuation coefficients are statistically significant. The full R-squared is 60 %, whereas the incremental explanatory power of BVS is 15 % which is thrice that of EPS. Common R-squared to both earnings and book equity is 41 %. Looking to the period before the crisis we find that book equity's valuation coefficient is significant, whereas that of earnings is not. The explanatory power of the model is 58 % in this sample, with an incremental R-squared for BVS at 20 %. The incremental R-squared of EPS is close to zero which is very low. Common R-squared is 38 %. During the crisis, full R-squared is 66 % which is 14 % greater than before the crisis. This difference is significant (z-value = 2.05) This suggests that the total value relevance of book equity and earnings has increased during the crisis. The incremental explanatory power of BVS decreases slightly, whereas the incremental explanatory power of earnings increases greatly with 11 percentage points. Common R-squared increases with over 10 %. Both valuation coefficients are significant. The book equity valuation coefficient is lower during the crisis, but the difference is not significant (t-value = 0.85). The earnings valuation coefficient during the crisis is thrice that of before the crisis, and the difference is significant (t-value = 1.97).

Our conclusions to hypotheses H1 and H2 are thus: H1) The equity book valuation coefficient decreases during the crisis. Thus, we have no evidence to support of this hypothesis. H2) The earnings valuation coefficient increases significantly during the crisis. The incremental R-squared also increases. We therefore have evidence in favor of the contrary to the hypothesis.

Looking to panel B, we analyze the associations between book equity, cash flows from operations and earnings accruals. All these components are statistically significant in the full sample. R-squared full is 64 %. The incremental explanatory power of 1) BVS, and 2) CFO and accruals are 9 % and 8 %, respectively. Thus, the disaggregated earnings items, namely funds and accruals, have an incremental explanatory power greater than earnings itself in the full sample. This tells us that variability in cash flows and accruals are better at explaining variability in share prices than earnings itself. Only book equity has a significant valuation coefficient before the crisis. In the same period, the incremental explanatory power of book equity is 11 %, while it is 3 % for the earnings components. The explanatory power of the model is 70 % during the crisis, which is greater than before the crisis (61 %). The difference in full R-squared between the two periods is significant (z-value = 2.61). As in panel A, the incremental R-squared of book equity falls. Incremental R-squared of earnings items is five times that of before. The common R-does not increase. All the valuation coefficients are significant. Book equity's valuation coefficient declines, but the difference is not statistically significant (t-value = 0.52). The cash flow valuation coefficient over doubles during the crisis compared to before, but the difference is not significantly different from zero at 5 % level of significance (t-value = 1.93). The accruals valuation coefficient doubles and the change is statistically significant.

Regarding hypotheses H1, H3 and H4, we conclude the following: H1) BVS' coefficient and incremental explanatory power fall during the crisis, so we do not have any support for the hypothesis' claim. H3) The cash flows valuation coefficient does not decrease, so we do not have evidence for this hypothesis. H4) The accruals valuation coefficient increases significantly, so we have strong evidence for this hypothesis.

[Table 3.5.1 about here]

Extending specifications (1a) and (2a), we control for negative earnings and negative cash flows. Regression results for our new specifications (1b) and (2b) are found in Table 3.5.2. The inclusion of LOSS*EPS in panel A does not affect the explanatory power of the model under the full sample. It does, however, decrease the incremental R-squared of book equity from 15 % to 12 %. The R-squared common to BVS, EPS and LOSS*EPS is 44 %. The coefficient estimates barely change, and the coefficient on LOSS*EPS is negative as expected, but it is not significant (t-value = -0.69). Before the crisis, the same coefficient is positive, but not significant (t-value = 0.57). The magnitudes of the valuation coefficients of book equity and earnings are almost the same. During the crisis, however, the LOSS*EPS coefficient is negative and significantly so (t-value = -2.12). Controlling for losses gives an incremental explanatory power for EPS and LOSS*EPS at 13 %, at the cost of book equity's incremental R-squared which is reduced to 8 % (compare with panel A in Table 3.5.1). Also, controlling for losses increases the earnings valuation coefficient during the crisis. The difference in the earnings valuation coefficient between the two periods is now nearly 2, compared to 1.4 when applying specification (1a). This difference is significant (t-value = 2.05).

Panel A reveals no support for H1 or H2. Again, to the contrary of H2's prediction, earnings are significantly more value relevant during the crisis due to the significantly greater valuation coefficient and the increased incremental R-squared.

Looking to panel B, we search for changes that occur due to controlling for negative cash flows from operations. The valuation coefficients are still significant in the full sample, and there are no great changes in their estimated values. The NEG*CFO coefficient is negative, as expected, but not significantly so (t-value = 0.56). Before the crisis, the book equity coefficient is still significant and NEG*CFO is close to zero and is not significant. During the crisis all valuation coefficients are significant, including that of NEG*CFO. However, the difference in NEG*CFO before and during coefficients is not significant. The valuation of the accruals component is still significantly greater during the crisis (t-value = 2.17). Summarizing on our hypotheses, there is still no support in favor of H3, but we still have significant support for H4.

[Table 3.5.2 about here]

Controlling for firm size, we add an additional intercept term. We classify a firm year observation as belonging to a large firm if that observation has total assets greater than the sample median. Our results are listed in Table 3.5.3. Panel A shows that the earnings and book equity valuation coefficients are still significant. The LARGE dummy is positive and significant (t-value = 3.04). This suggests that over the complete observation period, large companies have a value added to them which is associated with economic factors such as earnings persistence and financial health (Barth et al. [1998]). Before the crisis, only BVS is significant along with the size dummy. During the crisis, both BVS and EPS are significantly positive, along with LARGE. The change in the valuation coefficient of EPS is, once again, significant. The size valuation coefficient, however, holds only half the value from before the crisis and is less significant than before. The difference is not statistically significant, but, nonetheless, it suggests that the value-added from being a large firm is less during the crisis than before. Cet. par., if perceived risk falls, an extra dollar of expected cash flow in the future is more worth today. This explains why the coefficient is still significant. Nothing interesting happens to our R-squares. Our results show that we have no support for hypothesis H1 and H2.

Panel B enlists the results in the cash flow specification. In the full sample and before the crisis the firm size coefficient is statistically significant at the 1 % level. During the crisis all valuation coefficients are still significant. As in panel A, the size coefficient about halves and is less significant (now at the 5 % level). The difference in the LARGE coefficients is not statistically significant. We discuss the intuition of what happens, above.

Hypothesis H3 is not supported by our findings, but our earlier conclusion on H4 still remains: there is statistical evidence of that accruals have kept their value relevance during the crisis. In fact, the results indicate that they are more value relevant during the crisis.

[Table 3.5.3 about here]

Controlling for industry valuation effects, we estimate models (1d) and (2d). The results are found in Table 3.5.4. Panel A reveals that the industry dummies are jointly significant in the full sample. In the same sample, the valuation coefficients are significant, including that on LARGE. Industry dummies are jointly significant in the period before the crisis. In the same period, book equity is value relevant. The size coefficient is also significant. During the crisis, both book equity and earnings are significant. The size coefficient is not significant, contrary to what it was in (1c). While the earnings valuation coefficient is changed, as seen earlier in the other specifications, the difference between that in the before sample and that during the crisis is no longer significant. Thus, controlling for industry membership renders the increase in the earnings valuation and the size coefficient insignificant. Taking industry valuation effects into account, the increase in aggregate earnings' value relevance during the crisis is reduced. The increase in total R-squared indicates that the total value relevance increases. There is still no support for hypothesis 1 and 2.

In panel B all the valuation coefficients, except on the NEG*CFO interaction, are significant. The industry dummies are jointly significant. The size and BVS coefficients are still significant before the crisis, as we found earlier. The industry indicators are jointly significant in this sample. During the crisis, they are not. Contrary to with (2c), the size coefficient is insignificant during the crisis. The increased valuation coefficients for earnings and accruals are significantly different to those before the crisis. Our statistical findings suggest that cash flows' value relevance has increased significantly during the crisis. Thus, we may refute H3. Accruals' increased value relevance still remains. The increase in total R-squared shows an increase in total value relevance.

[Table 3.5.4 about here]

3.5.2 Explanatory Power

Our regression analyses show that the full R-squares increase noticeably during the crisis. E.g., panel A in Table 3.5.1 shows that the explanatory power increases 14 %, from 58 % to 66 %, whereas panel B shows an increase of 15 %, from 61 % to 70 %. Both these changes are statistically significant with Cramer (1987) z-values. We inferred from this that the total value relevance increased during the crisis compared to before. But as we discussed in chapter 3.3, there are dangers in directly comparing the R-squares between our two samples. To check the robustness and validity of our assertion that total value relevance has increased during the crisis, we use one of the standardized residual approaches suggested by Gu (2007). The method is explained in section 3.3. From the total R-squares we have indications of that pricing errors should be lower during the crisis. We test the null of the mean-difference in absolute standardized pricing errors being equal to zero, with the alternative that the pricing errors during the crisis are less than those during the crisis. This is therefore a one-sided test.

The results are shown in Table 3.5.5. Notice how *lower* average pricing errors go side by side with *greater* explanatory power. The numbers show unanimously that pricing errors were greater before the crisis than under the crisis as seen by the positive differences to the right. All differences in pricing errors are significant at the 5 % level, except that in (1c) [p-value = 0.0508]. Thus, we conclude that pricings errors are significantly greater before the crisis compared to during the crisis. This means that our initial claim based on the difference in R-squares, that the total value relevance increases, still remains.

[Table 3.5.5 about here]

3.5.3 Robustness Checks

In chapter 3.4 we divide our full sample into two periods: "before crisis" (years 2005 and 2006), and "during crisis" (years 2007 and 2008). We would like to see if our results are sensitive to the definition of crisis years. Thus, we do a robustness check by varying the samples. Year 2007 is a border case year, and a thorough discussion is needed to determine whether it meets the criteria of being a crisis year or not (e.g., see U.S. Senate [2011]). As a robustness check we remove year 2007 observations entirely from our sample. Years 2005 and 2006 are now before crisis years, whereas 2008 is still the crisis year.

We estimate all our specifications with our new samples. The results are listed in Table 3.5.6. Panel A shows the results on the difference in the valuation coefficients. Models (1b) through (1d) show a significant decrease in the value relevance of equity book values and a significant increase in the value relevance of earnings. These results are consistent with Collins et al. [1997]'s finding that the value relevance of book values and the income statement move inversely to each other. The value relevance of accruals increases significantly during the crisis in all the cash flow models ([2a] through [2d]).

Further on, panel B shows the results with respect to explanatory power and pricing errors. All specifications, except (1a), show a significant increase in explanatory power during the crisis. All specifications also show a significant decrease in pricing errors.

The different sample combinations yield signs on the differences in valuation coefficients that are consistent with what we found in section 2.5.1. All-in-all, we are comfortable with saying that the direction of change in the value relevance of book equity and earnings is robust to various definitions of "before" years and of "during crisis" years. Our previous findings that the total value relevance increases and that pricing errors decrease during the crisis are also robust to these definitions.

[Table 3.5.6 about here]

3.6 Concluding Remarks

We look to firms enlisted on Oslo Stock Exchange (OSE) during a four year period (2005-2008) to find out how the financial crisis affected the value relevance of accounting information. We divide the period 2005-2008 into a "before crisis" period (2005-2006) and "during crisis" period (2007-2008).

Overall, we find that the total value relevance of accounting information has increased during the period. The findings of Barth et al. [1998] show an inverse relationship between the book equity's and earnings' value relevance. They argue that this is due to the fact that the "liquidation effect" dominates the "unrecognized net assets effect" (see section 2.3.2). Based on previous crisis and financial distress research (Barth et al. [1998], Graham et al. [2000] and Collins et al. [1997]) we hypothesize that book equity's value relevance will increase and earning's value relevance decrease during the crisis. We find no evidence to support these hypotheses in either specification. In fact, with regards to earnings, we find the opposite: earnings are more value relevant during the crisis than before. Thus, it apparently looks as if the "unrecognized net assets effect" is not dominated by the "liquidation effect". In fact, the opposite may be true: that the effect of unrecognized net assets dominates the liquidation effect. Our findings are consistent with the minority of crisis research (e.g., Davis-Friday and Gordon [2005]).

Further on, we find that accruals are significantly more value relevant during the crisis and believe that this is due to increased impairments of assets during the crisis. Cash flows are only found to be significantly more value relevant during the crisis in two of our specifications. Overall, our findings suggest that the increased value relevance of earnings during the crisis can probably be attributed to the impairments. Our findings are robust to dropping year 2007 as a crisis year.

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	Full Sample					Before Crisis				
	P	BVS	EPS	CFO	ACCR	P	BVS	EPS	CFO	ACCR
Mean	50.391	32.486	4.425	6.428	-2.033	57.739	33.358	5.950	7.270	-1.333
Standard deviation	63.431	51.374	13.015	15.566	12.128	64.009	50.949	13.207	17.031	12.651
1st quartile	8.875	4.363	-0.243	-0.058	-3.399	13.300	3.746	0.012	-0.026	-2.573
Median	27.325	14.690	0.969	1.359	-0.501	35.110	14.136	1.556	1.297	-0.302
3rd quartile	68.185	41.681	5.264	7.489	0.351	79.750	43.657	6.995	9.869	0.450
Std.dev. To Mean Ratio	1.259	1.581	2.941	2.422	-5.965	1.109	1.527	2.219	2.343	-9.491

	During Crisis				
	P	BVS	EPS	CFO	ACCR
Mean	44.154	31.746	3.131	5.716	-2.625
Standard deviation	62.348	51.792	12.727	14.197	11.653
1st quartile	7.370	5.272	-0.790	-0.137	-4.097
Median	22.300	14.900	0.656	1.514	-0.767
3rd quartile	56.000	39.784	4.407	6.611	0.152
Std.dev. To Mean Ratio	1.412	1.631	4.065	2.484	-4.440

Table 3.4.1: Summary statistics by sample

	Full Sample				
	P	BVS	EPS	CFO	ACCR
P	1.000				
BVS	***0.716	1.000			
EPS	***0.669	***0.687	1.000		
CFO	***0.643	***0.689	***0.654	1.000	
ACCR	**-0.103	**-0.117	***0.239	***-0.578	1.000

	Before Crisis				
	P	BVS	EPS	CFO	ACCR
P	1.000				
BVS	***0.698	1.000			
EPS	***0.592	***0.758	1.000		
CFO	***0.584	***0.654	***0.677	1.000	
ACCR	**-0.165	-0.083	*0.139	***-0.634	1.000

	During Crisis				
	P	BVS	EPS	CFO	ACCR
P	1.000				
BVS	***0.737	1.000			
EPS	***0.732	***0.631	1.000		
CFO	***0.706	***0.729	***0.631	1.000	
ACCR	-0.058	*-0.153	***0.327	***-0.527	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ [p-value for the test with the null hypothesis that a correlation is equal to zero]

Table 3.4.2: Pearson correlations by sample

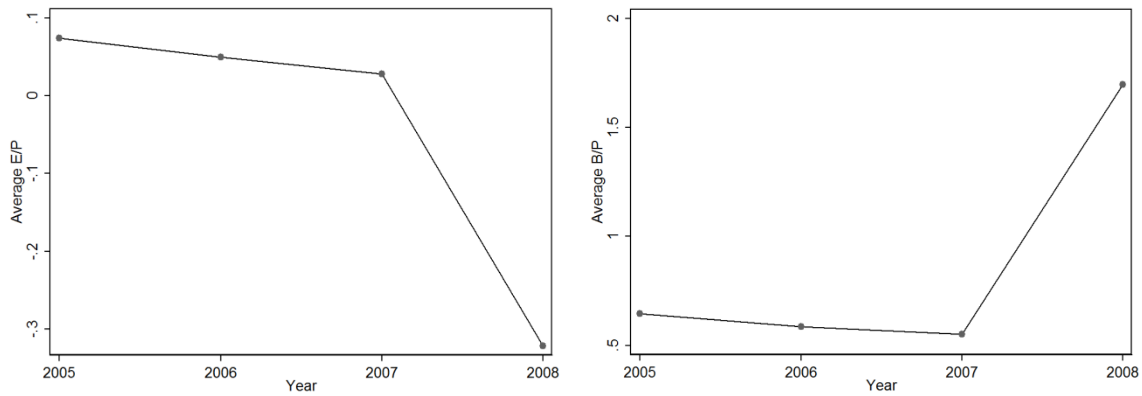

Figure 2.4.1: Average E/P and average B/P over the years.

PANEL A: $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \varepsilon_{it}$

Components	Full Period Coefficient	Full Period T-stat	Before Crisis Coefficient	Before Crisis T-stat	During Crisis Coefficient	During Crisis T-stat	Coeff. Difference[1]	T-stat[2]
BVS	***0.600	5.59	***0.734	4.10	***0.551	4.70	-0.183	-0.85
EPS	***1.634	4.23	0.723	1.22	***2.168	4.98	*1.445	1.97
Intercept	***23.668	10.71	***28.937	9.10	***19.858	7.15		

R-squares	Full Period Adjusted R-sq.	Before Crisis Adjusted R-sq.	During Crisis Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.60	0.58	0.66	*0.08	2.05
BVS Incremental	0.15	0.20	0.13	-0.07	
EPS Incremental	0.05	0.00	0.12	0.12	
Common	0.41	0.38	0.42	0.04	

PANEL B: $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + u_{it}$

Components	Full Period Coefficient	Full Period T-stat	Before Crisis Coefficient	Before Crisis T-stat	During Crisis Coefficient	During Crisis T-stat	Coeff. Difference[1]	T-stat[3]
BVS	***0.576	5.18	***0.655	3.25	***0.537	5.07	-0.117	-0.52
CFO	***1.864	4.65	1.058	1.68	***2.466	6.67	1.408	1.93
ACCR	***1.118	3.20	0.285	0.58	***1.616	4.14	*1.331	2.12
Intercept	***22.128	10.92	***28.382	8.28	***17.711	8.45		

R-squares	Full Period Adjusted R-sq.	Before Crisis Adjusted R-sq.	During Crisis Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.64	0.61	0.70	**0.10	2.61
BVS Incremental	0.09	0.11	0.07	-0.04	
CFO & ACCR Incr.	0.08	0.03	0.16	0.13	
Common	0.47	0.47	0.47	0.01	

*** p < 0.001, ** p < 0.01, * p < 0.05
T-statistics are calculated using White heteroskedasticity robust standard errors. The null hypothesis is that of coefficients being equal to zero.
Z-statistic for the difference in full adj. R-squares is calculated by Cramer (1987)'s standardard deviation. The null hypothesis is that of the difference being equal to zero.

1. The differences are calculated by subtracting the before crisis coefficient estimate or R-squared, from the corresponding measure during the crisis.

2. T-statistics are obtained from the ωi (i = 1, 2) coefficients by regressing:

$$P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \omega_0 CRISIS_t + \omega_1[CRISIS_t * BVS_{it}] + \omega_2[CRISIS_t * EPS_{it}] + \varepsilon_{it}$$

3. T-statistics are obtained from the ωi (i = 1, 2, 3) coefficients by regressing:

$$P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \omega_0 CRISIS_t + \omega_1[CRISIS_t BVS_{it}] + \omega_2[CRISIS_t CFO_{it}] + \omega_3[CRISIS_t ACCR_{it}] + u_{it}$$

Table 3.5.1: Regression results on specifications (1a) and (2a)

PANEL A: $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3[LOSS_{it} * EPS]_{it} + \varepsilon_{it}$

	Full Period		Before Crisis		During Crisis			
Components	Coefficient	T-stat	Coefficient	T-stat	Coefficient	T-stat	Coeff. Difference[1]	T-stat[2]
BVS	***0.580	4.49	***0.758	3.55	***0.485	3.81	-0.273	-1.10
EPS	***1.746	3.25	0.613	0.81	***2.598	4.26	*1.985	2.05
LOSS*EPS	-0.587	-0.69	0.844	0.57	*-1.878	-2.12	-2.722	-1.58
Intercept	***23.237	11.67	***29.209	9.78	***17.924	7.47		

R-squares	Adjusted R-sq.	Adjusted R-sq.	Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.60	0.58	0.67	*0.09	2.27
BVS Incremental	0.12	0.18	0.08	-0.10	
EPS & LOSS*EPS Incr.	0.05	0.00	0.13	0.12	
Common	0.44	0.39	0.46	0.07	

PANEL B: $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4[NEG_{it} * CFO_{it}] + u_{it}$

	Full Period		Before Crisis		During Crisis			
Components	Coefficient	T-stat	Coefficient	T-stat	Coefficient	T-stat	Coeff. Difference[1]	T-stat[3]
BVS	***0.567	4.61	**0.654	3.01	***0.499	4.28	-0.156	-0.63
CFO	***1.910	4.13	1.058	1.51	***2.656	6.26	1.597	1.95
ACCR	***1.135	3.19	0.285	0.56	***1.668	4.42	*1.383	2.17
NEG*CFO	-0.701	0.56	-0.008	0.00	*-1.985	-1.97	-1.977	-0.69
Intercept	***21.839	10.95	***28.379	8.59	***16.707	8.42		

R-squares	Adjusted R-sq.	Adjusted R-sq.	Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.64	0.60	0.70	**0.10	2.69
BVS Incremental	0.08	0.10	0.05	-0.05	
CFO, ACCR & NEG*CFO Incr.	0.08	0.03	0.16	0.13	
Common	0.48	0.47	0.49	0.02	

*** p < 0.001, ** p < 0.01, * p < 0.05

T-statistics are calculated using White heteroskedasticity robust standard errors. The null hypothesis is that of coefficients being equal to zero.

Z-statistic for the difference in full adj. R-squares is calculated by Cramer (1987)'s standardard deviation. The null hypothesis is that of the difference being equal to zero.

1. The differences are calculated by subtracting the before crisis coefficient estimate or R-squared, from the corresponding measure during the crisis.

2. T-statistics are obtained from the ωi (i = 1, 2, 3) coefficients by regressing:

$$P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3[LOSS_{it} * EPS_{it}] + \omega_0 CRISIS_t + \omega_1[CRISIS_t * BVS_{it}] + \omega_2[CRISIS_t * EPS_{it}] + \omega_3[CRISIS_t * LOSS_{it} * EPS_{it}] + \varepsilon_{it}$$

3. T-statistics are obtained from the ωi (i = 1, 2, 3, 4) coefficients by regressing:

$$P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4[NEG_{it} * CFO_{it}] + \omega_0 CRISIS_t + \omega_1[CRISIS_t * BVS_{it}] + \omega_2[CRISIS_t * CFO_{it}] + \omega_3[CRISIS_t * ACCR_{it}] + \omega_4[CRISIS_t * NEG_{it} * CFO_{it}] + u_{it}$$

Table 3.5.2: Regressions results on specifications (1b) and (2b)

PANEL B: $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO]_{it} + \gamma_5 LARGE_{it} + u_{it}$

	Full Period		Before Crisis		During Crisis			
Components	Coefficient	T-stat	Coefficient	T-stat	Coefficient	T-stat	Coeff. Difference[1]	T-stat[3]
BVS	***0.533	4.12	*0.597	2.51	***0.474	3.96	-0.122	-0.46
CFO	***1.917	4.22	1.011	1.45	***2.674	6.48	*1.663	2.05
ACCR	***1.165	3.26	0.256	0.50	***1.713	4.70	*1.457	2.31
NEG*CFO	-0.681	-0.57	-0.062	-0.02	*-1.998	-2.02	-1.936	-0.67
LARGE	**10.555	2.78	**18.275	2.81	*8.762	2.35	-9.513	-1.27
Intercept	***17.682	10.62	***22.535	8.42	***12.711	6.96		

R-squares	Adjusted R-sq.	Adjusted R-sq.	Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.64	0.61	0.71	**0.09	2.61
BVS Incremental	0.08	0.11	0.06	-0.06	
CFO, ACCR & NEG*CFO Incr.	0.09	0.03	0.16	0.13	
Common	0.48	0.47	0.49	0.02	

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

T-statistics are calculated using White heteroskedasticity robust standard errors. The null hypothesis is that of coefficients being equal to zero.

Z-statistic for the difference in full adj. R-squares is calculated by Cramer (1987)'s standardard deviation. The null hypothesis is that of the difference being equal to zero.

1. The differences are calculated by subtracting the before crisis coefficient estimate or R-squared, from the corresponding measure during the crisis.

2. T-statistics are obtained from the ω_i (i = 1, 2, 3, 4) coefficients by regressing:

$$P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS_{it}] + \alpha_4 LARGE_{it} + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVS_{it}] + \omega_2 [CRISIS_t * EPS_{it}] + \omega_3 [CRISIS_t * LOSS_{it} * EPS_{it}] + \omega_4 [CRISIS_t * LARGE_{it}] + \varepsilon_{it}$$

3. T-statistics are obtained from the ω_i (i = 1, 2, 3, 4, 5) coefficients by regressing:

$$P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO_{it}] + \gamma_5 LARGE_{it} + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVS_{it}] + \omega_2 [CRISIS_t * CFO_{it}] + \omega_3 [CRISIS_t * ACCR_{it}] + \omega_4 [CRISIS_t * NEG_{it} * CFO_{it}] + \omega_5 [CRISIS_t * LARGE_{it}] + u_{it}$$

Table 3.5.3: Regression results on specifications (1c) and (2c)

PANEL A: $P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS]_{it} + \alpha_4 LARGE_{it} + \sum_{j}^{N-1} \delta_j IND_{ij} + \varepsilon_{it}$

Components	Full Period		Before Crisis		During Crisis			
	Coefficient	T-stat	Coefficient	T-stat	Coefficient	T-stat	Coeff. Difference[1]	T-stat[2]
BVS	***0.522	4.39	**0.657	3.05	***0.467	4.09	-0.191	-0.78
EPS	***1.937	4.37	0.879	1.20	***2.579	4.65	1.700	1.85
LOSS*EPS	-0.500	-0.70	0.726	0.50	-1.569	-1.90	-2.295	-1.37
LARGE	**12.208	3.05	***20.383	3.60	7.804	1.53	-12.579	-1.65
Intercept	5.858	0.25	**44.952	2.80	-7.409	-0.28		
	F(9, 646)		F(9, 289)		F(8, 344)			
Industry dummies	***4.44		***3.87		1.38			

R-squares	Adjusted R-sq.	Adjusted R-sq.	Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.63	0.61	0.68	0.07	1.76
BVS Incremental	0.14	0.22	0.09	-0.13	
EPS & LOSS*EPS Incr.	0.07	0.03	0.13	0.10	
Common	0.41	0.36	0.45	0.09	

PANEL B: $P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO]_{it} + \gamma_5 LARGE_{it} + \sum_{j}^{N-1} \delta_j IND_{ij} + u_{it}$

Components	Full Period		Before Crisis		During Crisis			
	Coefficient	T-stat	Coefficient	T-stat	Coefficient	T-stat	Coeff. Difference[1]	T-stat[3]
BVS	***0.513	4.20	**0.572	2.55	***0.459	3.92	-0.113	-0.45
CFO	***2.087	5.01	1.222	1.87	***2.751	6.77	*1.529	1.99
ACCR	***1.358	4.38	0.486	0.92	***1.761	5.09	*1.275	2.02
NEG*CFO	-0.961	-0.82	0.178	0.06	*-2.203	-2.11	-2.380	-0.80
LARGE	***11.523	2.99	***20.902	3.29	7.568	1.83	-13.334	-1.76
Intercept	***26.824	2.08	*38.277	2.40	***17.128	1.06		
	F(9, 638)		F(9, 284)		F(8, 340)			
Industry dummies	***4.81		***4.26		1.62			

R-squares	Adjusted R-sq.	Adjusted R-sq.	Adjusted R-sq.	Adj. R-sq. Difference[1]	Z-stat
Full	0.66	0.64	0.71	0.07	1.76
BVS Incremental	0.10	0.14	0.06	-0.08	
CFO, ACCR & NEG*CFO Incr.	0.11	0.06	0.17	0.10	
Common	0.46	0.44	0.48	0.05	

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$
T-statistics are calculated using White heteroskedasticity robust standard errors. The null hypothesis is that of coefficients being equal to zero.
Z-statistic for the difference in full adj. R-squares is calculated by Cramer (1987)'s standard deviation. The null hypothesis is that of the difference being equal to zero.

1. The differences are calculated by subtracting the before crisis coefficient estimate or R-squared, from the corresponding measure during the crisis.

2. T-statistics are obtained from the ω_i (i = 1, 2, 3, 4) coefficients by regressing:

$$P_{it} = \alpha_0 + \alpha_1 BVS_{it} + \alpha_2 EPS_{it} + \alpha_3 [LOSS_{it} * EPS_{it}] + \alpha_4 \text{LARGE}_{it} + \sum_{j}^{N-1} \delta_j IND_{ij} + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVS_{it}] + \omega_2 [CRISIS_t * EPS_{it}] + \omega_3 [CRISIS_t * LOSS_{it} * EPS_{it}] + \omega_4 [\text{CRISIS}_t * \text{LARGE}_{it}] + \sum_{j=1}^{N-1} \omega_{j+4} IND_{ij} + \varepsilon_{it}$$

3. T-statistics are obtained from the ω_i (i = 1, 2, 3, 4, 5) coefficients by regressing:

$$P_{it} = \gamma_0 + \gamma_1 BVS_{it} + \gamma_2 CFO_{it} + \gamma_3 ACCR_{it} + \gamma_4 [NEG_{it} * CFO_{it}] + \gamma_5 LARGE_{it} + \sum_{j}^{N-1} \delta_j IND_{ij} + \omega_0 CRISIS_t + \omega_1 [CRISIS_t * BVS_{it}] + \omega_2 [CRISIS_t * CFO_{it}] + \omega_3 [CRISIS_t * ACCR_{it}] + \omega_4 [CRISIS_t * NEG_{it} * CFO_{it}] + \omega_5 [CRISIS_t * LARGE_{it}] + \sum_{j=1}^{N-1} \omega_{j+5} IND_{ij} + u_{it}$$

Table 3.5.4: Regression results for specifications (1d) and (2d)

	Full Sample		Before Crisis		During Crisis		Difference	
	$\|\overline{SPE}\|$	R-sq.	$\|\overline{SPE}\|$	R-sq.	$\|\overline{SPE}\|$	R-sq.	$\|\overline{SPE}\|$	R-sq.
(1a)	0.552	0.60	0.606	0.51	0.506	0.70	*-0.100	0.19
							(-2.05)	
(1b)	0.550	0.57	0.605	0.49	0.503	0.67	*-0.102	0.18
							(-2.10)	
(1c)	0.536	0.58	0.580	0.51	0.499	0.67	-0.080	0.16
							(-1.64)	
(1d)	0.525	0.60	0.569	0.54	0.487	0.68	*-0.082	0.14
							(-1.77)	
(2a)	0.537	0.60	0.594	0.51	0.489	0.70	*-0.105	0.19
							(-2.22)	
(2b)	0.536	0.60	0.593	0.51	0.488	0.70	*-0.105	0.19
							(-2.21)	
(2c)	0.524	0.61	0.570	0.53	0.485	0.71	*-0.085	0.18
							(-1.78)	
(2d)	0.514	0.63	0.557	0.56	0.478	0.71	*-0.078	0.15
							(-1.72)	

T-statistics in parantheses for the null hypothesis that the difference is equal to zero.
* $p < 0.05$ for the alternative hypothesis is that the difference is less than zero.

Table 3.5.5: Pricing errors

Samples: Before crisis (2005-2006) vs. during crisis (2008)

Panel A: Coefficients

	BVS		EPS		CFO		ACCR	
	Difference	Significant	Difference	Significant	Difference	Significant	Difference	Significant
(1a)	-	Yes	+	No				
(1b)	-	Yes	+	Yes				
(1c)	-	Yes	+	Yes				
(1d)	-	Yes	+	Yes				
(2a)	-	No			+	No	+	Yes
(2b)	-	No			+	No	+	Yes
(2c)	-	No			+	No	+	Yes
(2d)	-	No			+	No	+	Yes

Panel B: Explanatory power and pricing errors

	Full R-squared		SPE	
	Difference	Significant	Difference	Significant
(1a)	+	No	-	Yes
(1b)	+	Yes	-	Yes
(1c)	+	Yes	-	Yes
(1d)	+	Yes	-	Yes
(2a)	+	Yes	-	Yes
(2b)	+	Yes	-	Yes
(2c)	+	Yes	-	Yes
(2d)	+	No	-	Yes

+/- = Increase/decrease in value relevance during the crisis given by the coefficient estimates
"Yes" designates significance at the 5 % level.

Table 3.5.6: Robustness Checks

Chapter 4: Summary

In the first paper of this thesis, **"Differences in the Value Relevance of Financial Information across Industries"**, we suggest that book values and earnings carry less value relevant information in R&D intensive industries compared to other industries. We have two hypotheses. The first is that the total value relevance of accounting information in high-tech industries are less value relevant than in low-tech industries. We find no support for this, and we suspect that this may be attributed to that the R&D investments are average on losses. The second hypothesis is that the value relevance will increase in both industries when controlling for losses (Hayn [1995], Basu [1997], Joos and Plesko [2005]). We find no support for this, and suspect that losses on average are associated with unrecognized assets such that they are value relevant to begin with (Joos and Plesko [2005], Darrough and Ye [2007]). The findings are consistent during the robustness checks.

In the second paper, **"The Financial Crisis' Impact on the Value Relevance of Financial Information"**, we first hypothesize that the value relevance of book values increases during the crisis, and that the value relevance of earnings decreases during the crisis (Barth et al. [1998], Collins et al. [1997]). We do not find support for either. On the contrary, we find that earnings' value relevance increases during the crisis. We suspect that the finding comes from that the "unrecognized net assets" effect dominates the "liquidation" effect, as the two effects are described in Barth et al. (1998). We suggest that impairments will occur more frequently and in greater portions during times of crisis, and hypothesize that the accruals component of earnings consequently will be more relevant during the crisis. Our findings support the latter hypothesis.

In further research it could be interesting to continue the crisis research. One example could be to do more in-depth analyses on the consequences of financial and economic crises by disaggregating earnings items deeper.

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